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The Use of Paper in the Machine Shop

Precautions Taken by Skilled Mechanics—Besides Hindering Slippage, Paper Protects Machine Tables from Injury—Planer Kink Worth Noting—Paper Used as Feelers

By E. A. DIXIE

PAPER is an indispensable adjunct to many machine operations and yet it is seldom one sees mention in the technical press of even single instances of its use. Because of the lack of record of this important subject the writer here sets forth the uses and applications known to him in the hope that others, with wider experience than his, may come forward with their knowledge of the use of paper in machine shop practice, to the end that this most handy semi-precision shop appliance may be more widely known.

So far as the writer's experience goes there are but two fundamental uses for paper in machine work:

First, to increase frictional resistance.

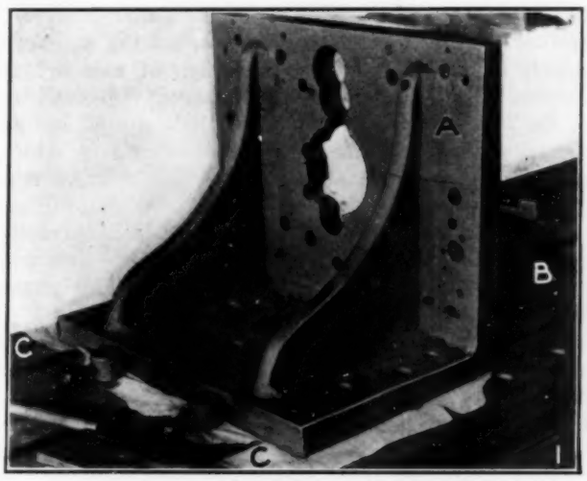
Second, as a spacer or shim.

Under the first heading the writer does not refer to such mechanisms as paper friction clutches (although these are most certainly mechanical devices) but he does refer to the use of paper to increase frictional resistance between surfaces to prevent one from sliding on the other.

An example of such use for paper is shown in Fig. 1, where the angle plate *A* is to be bolted to the table of a planer. The piece of work (not shown) secured to the angle plate projected beyond the side of the angle plate and the part of it to be planed was nearly a foot from the edge.

With these requirements and the angle plate bolted (without papering) direct to the table of the planer it was found that the thrust of the cut, after a few strokes of the planer, twisted the angle plate around out of square. But after the paper *C* was placed between the angle plate and the table the same bunters and bolts held it securely in place. In the example shown in Fig. 1 *A* is an angle plate, *B* the planer table and *C* pieces of soft white paper.

Very often castings or forgings are so slender that one must be very careful to avoid springing them when bolting or strapping them down, but they must be strapped down sufficiently to prevent their shifting under the thrust of the tool. In such cases soft paper placed between the work and the platen, especially under the points where the pressure of the straps comes, will usually prevent slipping. To further prevent slipping it is often advisable to place paper between the straps and the work and also between the straps and the blocking, when metal blocking is used under the "heel" of the strap.



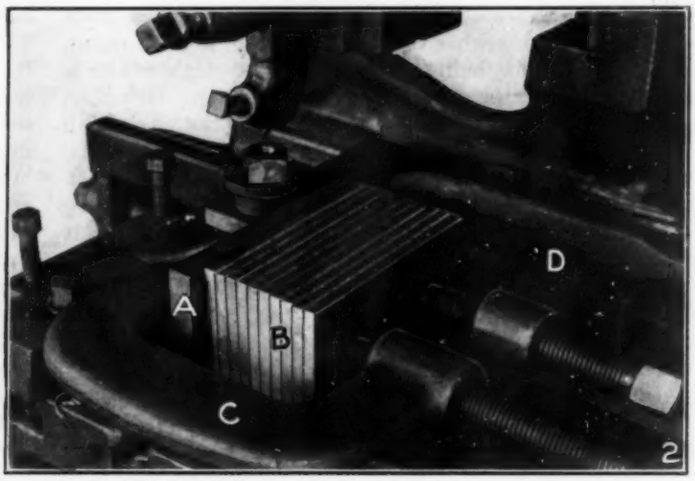
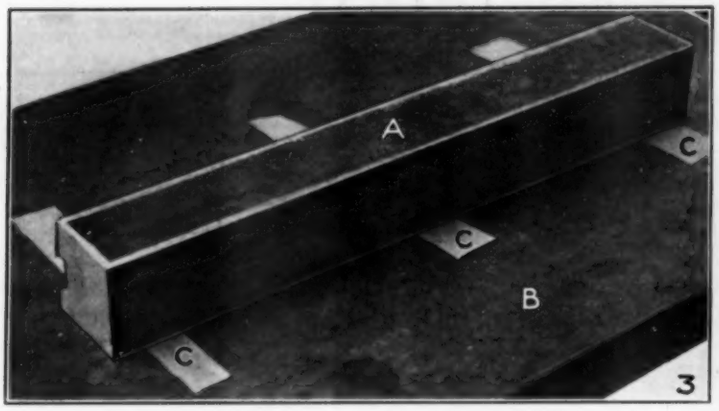


FIG. 1. ANGLE PLATE PAPERED TO PLANER TABLE. FIG. 2. THIN PLATES PAPERED TOGETHER TO PREVENT SHIFTING

The coefficient of friction between two planed metal surfaces is very low, even where one or both surfaces are rough castings. Even with castings just as they come from the foundry the friction is not materially greater, but place a piece of ordinary newspaper between the two surfaces before bolting or strapping them down and see what a difference it makes in resistance to the pressure of the cut.

Another application is shown in Fig. 2. The angle plate *A* is bolted to the table of the shaper. The ten ¼-in. pieces of machine steel *B* are to be planed on their edges. They are held to the angle plate by the two clamps *C* and *D*, but between each piece and between the angle plate and the first piece a piece of soft paper has been placed. With the paper thus placed the



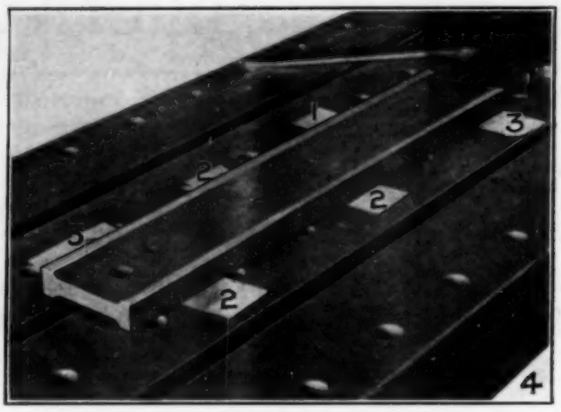


FIG. 3. TESTING A FLAT SURFACE. FIG. 4. IRREGULAR JOB PAPERED READY FOR CLAMPING

clamps need not be screwed up nearly as tight as they would have to be if the pieces of steel were clamped metal to metal.

While the use of paper under *slender* castings has been mentioned, its use also holds good with heavy, rugged castings where it is necessary to take extremely heavy cuts. No matter how carefuly one straps a piece of work to a machine table it is bound to be sprung, other conditions being equal, and the tighter it is strapped down the more it will be sprung. However, with newspaper between the surfaces the strapping need not be nearly so tight to obtain the same frictional resistance between them.

Besides the use of paper in connection with securing work to machines a similar application is found for it between machine parts which are subjected to shocks to prevent their shifting their relative positions under the influence of such shocks. A shim of thin preferably soft paper enormously increases the grip of machined surfaces one to another.

Under the second heading, "As a spacer or shim," there are endless examples from which one can draw.

An illustration is given in Fig. 3 which shows the testing of the truth of a machined surface by means of papers; *A* is a piece of square cold rolled steel which has been planed on one side; *B* is the surface plate, and at *C* are three strips of tissue paper. If the surface plate is true and the planed surface is flat the three papers will be gripped equally and the pull necessary to withdraw any one of them will be the same. If, however, either the work or the surface plate or both of them are out of true, then the errors and their approximate extent and locations can be noted by making this test at various parts of the surface plate and observing the way the papers are gripped. The application of this method of testing the truth of other machined surfaces such as the abutting parts of machines or to work held on machine tables or lathe faceplates and so forth will be at once apparent. Thus used the strips of paper are virtually very thin parallels which are much nearer to equality in thickness than are the usual run of metal parallels. When choosing paper for this application one should remember that a thin, hard paper will give by far the most dependable results. A soft paper is of no use for such tests. Because of its softness the weight of the metal part resting on it compresses it, and because of its high coefficient of friction we do not get a reliable indication when we pull the paper strips, for the slightly compressed strips will give almost the same "feel" as other strips which are bearing more of the weight. For work of this character I have obtained the most dependable results from a paper which is known by the trade name of "Frisket paper." This is a very thin, hard, transparent paper used by photo-engravers' retouchers. They, however, coat it with a thin film of rubber cement before use, while the machinist must use it without the rubber coat, *just as it comes from the paper maker.*

Another "shim" use for paper is in setting up work for machining. It is not the intention of this article to instruct *how* a job should be "papered" for machining. In the writer's estimation that would be an impossible task, for there are other elements which must be taken into consideration. A job may be correctly papered to prevent its moving or warping during the machining operation, but if the tools be incorrectly ground or the cuts be improperly taken the job will warp and crawl all over the machine table. This phase of papering must be learned by experience.

For this kind of work any kind of hard paper, cardboard or, if the work is very irregular, metal shims may be used to augment the papers.

In Fig. 4 a casting is shown set up and papered on the planer table. In this case the photograph was taken just after the planer hand had located and papered the irregularities in the casting. The figures shown on the pieces of paper indicate the numbers of pieces used at these locations. In this case hard cardboard, about 0.008 in. thick, was used. On this job six planer fingers will be used, one over each of the piles of time cards.

In the machining of accurate angle plates, straightedges, parallels, and so forth, paper is indispensable.

Fig. 5 shows the papering of a special parallel gib

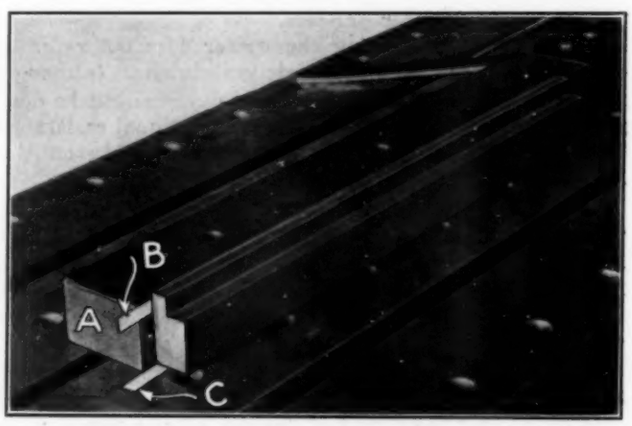


FIG. 5. PAPERING A GIB SO ITS EDGE WILL BE SQUARE WITH ITS SIDES

preparatory to planing. The two opposite faces have been planed and the operator is preparing to plane one of the edges. The planer shoe *A* may or may not be accurately square to the planer table; whether it is or not makes no difference, for if it is appoximately so he can pack out the bottom or the top of the parallel with papers, as shown at *B* and *C*, till the edge of the gib will finish truly square with its sides. With one edge square it is a simple matter to make the other one parallel to it.

On all classes of machine tool and other machine work size blocks and gages are almost indispensable to determine, with the degree of accuracy necessary to preclude excessive assembling costs, the relative locations or heights of different members. But accurate, expensive size blocks were never intended to be used as stops against the faces of which to set the cutting edges of hardened tools. With these combination size blocks any dimension can be set up and we can then place the requisite thickness of paper on top of the assembly of size blocks and the planer tool can be set down till it touches, not the expensive size block on the top of the assembly but an inexpensive piece of paper which is so soft that it cannot damage the block.

In Fig. 6 is again shown the special parallel gib shown in Fig. 5. The surface *A* has been finished square with the side *E*. It is now desired to finish the surface

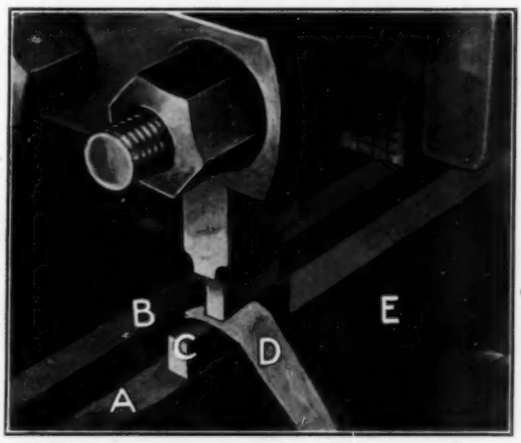
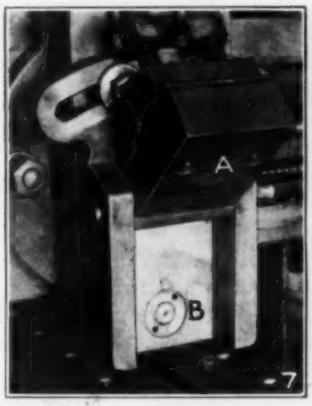


FIG. 6. PAPER USED TO SET THE FINAL FINISHING CUT

B parallel to *A* and ½ in. above it. In setting the tool for the cut the planer hand takes his ½-in. size block *C* and sets it on the surface *A*, and on top of it he places a thickness of paper *D* which his experience tells him will give the correct allowance for the operation (grinding or scraping) which is to follow the planing operation. Or it may be that the job is to be finished on the planer; in this case the thickness of paper used determines the depth of the final finishing cut to be taken.

The tool is brought down till it touches the paper and the planer hand tries the "feel" to determine the amount of finish which the tool at a certain setting will leave either for a subsequent finishing cut on the planer or for the grinder or scraper.

Another very little-known method of setting for both the final roughing and finishing cuts was developed by the late Mr. Smith, who had charge of the planer department at the Sigourney Tool Co., Hartford, Conn. It is commonly admitted that this concern does the finest metal planing in this country. At any rate if you want to hear a man's ability eulogized ask any planer hand who has worked under Mr. Smith: "Who is the best planer hand you ever knew?"



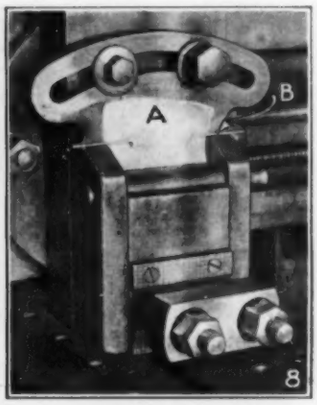


FIG. 7. CLAPPER BLOCK RAISED PREPARATORY TO PAPERING BEHIND THE CLAPPER. FIG. 8. CLAPPER BLOCK WITH PAPER BEHIND IT

In Figs. 7 and 8 is shown this exceptionally clever application of papering. A piece of paper, *A* Fig. 8, of the desired thickness and a little narrower and longer than the clapper block, is threaded on a wire *B* or the needle of a surface gage. The clapper block is raised as shown in Fig. 7 and the surfaces *A* and *B* cleaned, thus insuring that those parts of the clapper block and head which take the thrust of the cut have no particles of dirt to give a false setting.

The paper is then slipped in from the top behind the clapper block and the clapper block lowered as shown in Fig. 8. The bottom of the paper thus comes between *A* and *B*, Fig. 7, and lifts the tool a fraction of the thickness of the paper above the position it would occupy were there no paper between the surfaces *A* and *B*.

The first finishing cut is then taken with a broad tool and wide feed. When this cut is finished the clapper block is raised slightly, the paper removed and the clapper block again lowered. With the paper removed the clapper block comes into direct contact with its seat in the head, the tool is lowered that small fraction of the thickness of the paper which it was formerly lifted and is now in position to take the final finishing cut without altering the position of the tool as it was set for the first finishing cut.

Recently the writer had some blocks of steel approximately 4 in. long by 2 in. wide and about ¾ in. thick. They were used as spacers in a certain machine, and were parallel. On assembling them in place it was found that the parts which they were to space had been machined incorrectly and that it was necessary either to remachine the large parts of the machine parallel or taper the spacers about 0.004 in. from end to end. The job of tapering was done on a surface grinding machine. The spacers were held on the magnetic chuck with a strip of paper 0.002 in. at the center of their length and two pieces of the same thickness at the end which was to be thinned. Two parallels slightly thinner than the spacers were placed on the magnetic chuck to prevent shifting sidewise and a bunter at the thick end to take the thrust of the cut. These latter precautions may not have been necessary but they insured the job staying put on the chuck, for there was theoretically only a *line* direct metal to metal contact between the spacers and the chuck at the thick end of the spacers and lifting the other end only 0.004 in. from the chuck greatly decreases its magnetic pull.

Special Equipment in a Railroad Boiler Shop

Heavy Forms Used for Flanging Sheets—Powerful Riveting Machine for Repairing Mud Rings—Special Equipment for Boiler Flue Work

By J. V. HUNTER
Western Editor, *American Machinist*

THE modern locomotive boiler shop has little opportunity to work on a manufacturing basis for few parts, outside of flue work, are made in lots of more than a few pieces at a time. Where the opportunities for duplication of parts exist the foremen frequently develop special facilities to reduce costs. A number of pieces of such equipment has been made in the shops of the Chicago & Alton Railroad at Bloomington.

FIG. 1. CAST-IRON FORMS USED FOR FLANGING BOILER SHEETS

FIG. 2. SOME FLANGING FORMS AND OPEN FORGE FOR HEATING PLATES

A collection of heavy cast-iron forms shown in Figs. 1 and 2 has been made to aid in flanging flue sheets and kindred parts. An example of this work is shown lying on the forms at *A*, Fig. 1. A large open-top coke forge is used for heating sections of the plates preparatory to bending. The smoke hood over this fire with its exhaust pipe that connects with the underground exhaust system shows in the background of Fig. 2.

A pneumatically operated clamping device, Fig. 3, is used for holding the sheets on the form while flanging. The heavy base and sliding crossbeam are grey cast iron. The two 3-in. steel guide pins are approximately 12 ft. between centers so that there is plenty of side clearance for handling practically any job that will come into the shop. The top crossbeam is lifted by two 12-in. air cylinders, one bolted to each end of the base. The cylinders are fitted with double acting pistons and packing glands surround the rods so that air can be used for clamping as well as for lifting. As the travel of the pistons in the cylinders is limited the clamp is given additional range of capacity by providing means of adjustment on the piston rods. These rods are threaded for about 30 in. with adjusting nuts above and below the ends of the crossbeam. The power of this clamping press is so limited that it is impractical to use it directly to assist in the flanging work. All flanging and bending is done by sledging while the work is clamped down on the form.

FIG. 3. CLAMPING PRESS FOR HOLDING PLATES ON THE FORMS

The heavy riveter shown in Fig. 4 was built in the shop and is used for riveting mud rings. It was stated

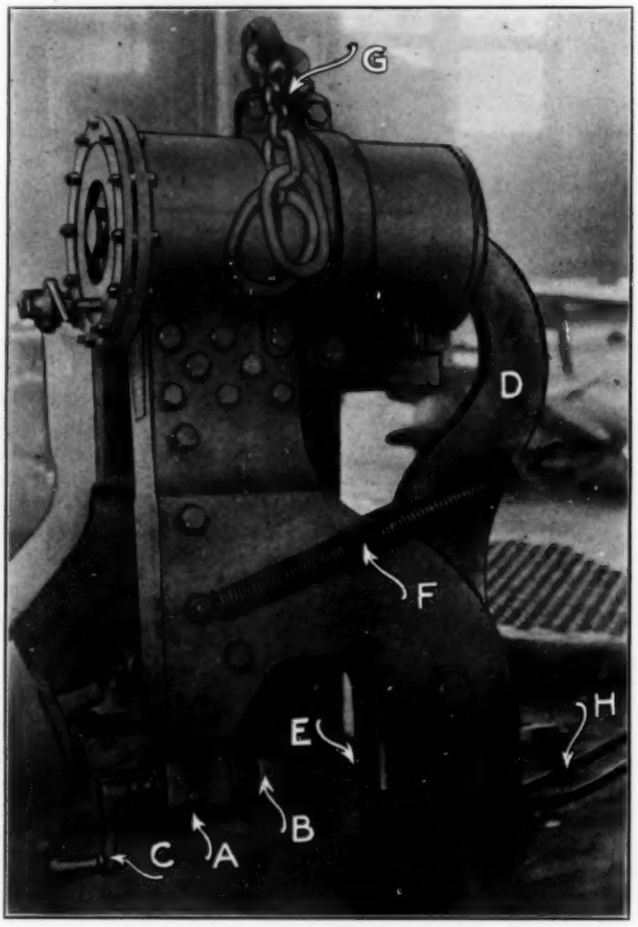


FIG. 4. LARGE POWER RIVETING PRESS FOR MUD RING WORK

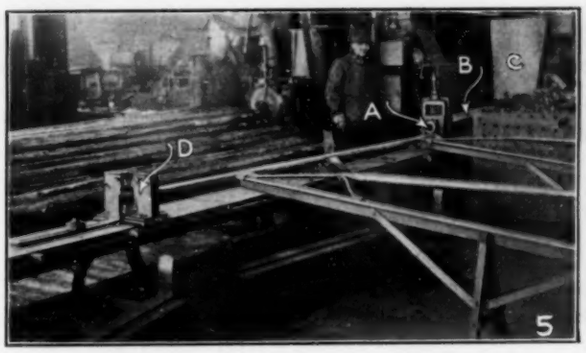


FIG. 5. ROTARY SHEAR FOR CUTTING BOILER FLUES

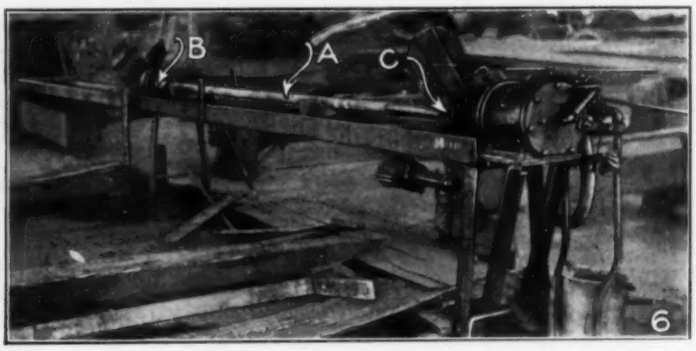


FIG. 6. HYDRAULIC TESTING DEVICE FOR BOILER FLUES

that its capacity is 75 tons riveting pressure. However it only figures out to a possible working pressure of 55 tons with 90 lb. air pressure, which is a high pressure for the end of a long air line. The air cylinder is 15 in. inside diameter and the ratio of the lower arms is seven to one.

The frame is made of two steel plates that have been forged on one end to form a semi-circular socket in which the cylinder is bolted. Spacing blocks bolted between the two plates separate them to permit the insertion of the levers of the working mechanism. The upper jaw *A* is a forging held in the frame by heavy bolts. It carries the stem for the adjustable riveting die *B*. This stem is adjustable to provide for various thicknesses of work. It has been cut with a heavy square thread and may be turned in or out by the crank *C*. The heavy lever *D* transmits the pressure from the piston to the heading die *E*. After each stroke the piston and lever are pulled back to the starting position by the pair of coil springs *F*. The chains *G* are for hanging the press from an overhead crane hook. The boss riveter uses the lever handle *H* to guide the press into position and line the dies over the rivet.

Cutting Boiler Flues to Length

Among the shop built tools found in the flue-welding department is the flue cutting machine shown in Fig. 5. The disk-shaped knife *A* is carried on the shaft *B* which has a bearing and pulley enclosed in the belt guard *C*. No speed reduction is used from the line-shaft drive and the speed of the cutter exceeds 200 r.p.m. The cutter rotates the pipe which is supported by rollers directly beneath the knife edge. One feature on this device that has not been found in other shops visited by the writer is the holding device *D* that is employed to enclose the loose end. In many cases this loose end has been observed to flop around loosely in an open V-block. This device in the Bloomington shop incloses the loose end by a pair of trigger-like fingers that permit the tube to slip down inside when it is laid on top. Moreover the tube once inclosed is safe, and can be readily slipped out endwise after the end has been cut off.

The hydraulic flue testing outfit shown in Fig. 6 probably exists in some form in most shops. However, this one has several features that simplify its operation and are well worth mentioning. Its frame is a length of 12-in. channel that lies with its flanges up, thus forming a trough that slopes to the far end carrying all the spilled water to a sump tank. From this tank the water flows through a check valve into a pressure storage tank and is ready for use again. The tube *A* in testing position lies between a stationary head *B* and the pneumatic clamping head *C*. The stationary head is adjustable for different lengths of tubes but need only be set once as all clamping is done from the other end. It is faced with rubber gasket material that seals that end while the tube is under the testing pressure.

A view of the working side of the operating end of the testing device is shown in Fig. 7. When the flue *A* is in position, the water inlet pipe *B* is inside. The end of the flue slips inside of the ring *C* and rests against a gasket on the inside of the recess. When the head *D* is set up the gasket forms a watertight seal during the test. The head *D* is carried on the end of the piston from the 8-in. air brake cylinder *E*.

When ready to test a tube, air is turned into the cylinder by the valve *F*. The head *D* moves up to the tube, clamping one end against the stationary end and sealing the other end by the gasket in the ring *C*. Opening the valve *G* permits water to flow from the storage reservoir through inlet *B*, thus filling the tube. Pressure is applied by opening the air valve *H* which acts on the storage reservoir and so directly through the water supply line to the tube being tested. The testing pressure is read on the gage. When the test is completed, valve *G* is closed cutting off the water supply, and the tube is released by shifting valve *F* to exhaust the air from the clamping cylinder. The air pressure need not be released from the storage reservoir until the water supply is nearly exhausted. Then when the pressure is relieved the water that has collected in the sump tank automatically flows in through the check valve, refilling the pressure reservoir.

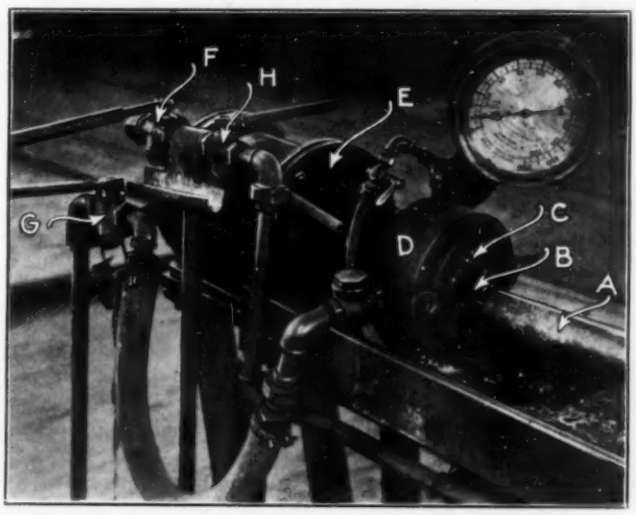


FIG. 7. CLAMPING HEAD AND GAGE ON FLUE TESTER

Design of Helical Springs

Controlling the Spring Criterion—Methods of Making Coil Springs—Sample Investigation of a Material for a Helical Spring

BY JOSEPH KAYE WOOD
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THE "Material Index" $\left(\frac{\pi S}{G}\right)$ was discussed in the previous article, in which it was shown that the value of this index might be as high as 0.030 where steel music wire of the highest quality is used. In this article it will be shown how the factors appearing in the "Spring Criterion," $\left(\frac{h-H}{H}\Big/\frac{D^2}{d^2}\right)$, may be controlled within satisfactory limits, in order that the value of this criterion may be less than the safe limit, i.e.,

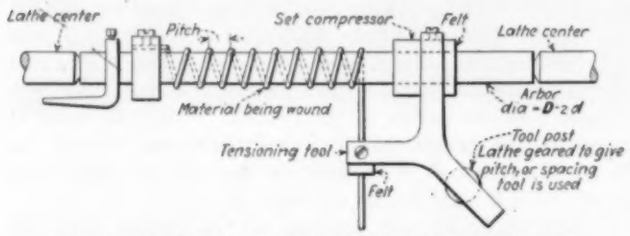


FIG. 1. WINDING A SPRING IN A SPEED LATHE

less than the material index. The present article will also include a sample investigation of a material from which helical springs were made and tested.

SPRING CRITERION $\left(\frac{h-H}{H}\Big/\frac{D^2}{d^2}\right)$

Consider first "d" the diameter of the wire. Material of "round" cross section, which is the only section being considered here, is never truly round in the practical sense, and if commercial bar or wire material is carefully measured, the diameter will be found to vary by about 1 to 5 per cent from minimum to maximum, the per cent of variation being the greatest for the smallest size wire. An average diameter of the material should always be used in the design of springs, because even then the variation will be magnified by the second power in the spring criterion and by the fifth power in the deflection formula. Then, the unavoidable error to be expected from this source is probably of the order of 3.0 per cent.

The other dimensions used in the above formula are: "D," the mean diameter of the spring; "H," the solid length of the spring; and "h," the maximum length of the spring. They are controlled mostly by the care taken in winding or coiling the spring. There are three general methods of making a helical spring, namely: (a) winding, (b) coiling, and (c) a combination of winding and coiling. The method used depends on the number of springs to be made.

SPRING MAKING

(a) "Winding" a spring is understood to mean bending a certain length of wire or rod in the form of a helix *on* an arbor, the diameter of which is usually somewhat less than the inside diameter $(D-d)$ of the spring and equal to $D-2d$ approximately. The arrangement of the apparatus is shown in Fig. 1. Hence, the essentials of spring winding are: First, an arbor equal in diameter to approximately D—$2d$; second, means of rotating the arbor and feeding or spacing of the material at a uniform pitch, such as a speed or engine lathe, and even by hand (using a Hjorth spring winder), the method used depending on the diameter of the material; third, tension on the wire or rod equal in unit stress to less than 50 per cent of the elastic limit. Also, after a compression spring is formed it is compressed in order to make it "set." This method, which is used for making small quantities of springs has a disadvantage in that it is necessary to allow for the increase in spring diameter that occurs when the spring is removed from the arbor.

(b) "Coiling" a spring, Fig. 2, means bending the wire or bar into the form of a helix by using three rollers, which remain *outside* the spring being coiled, and a tensioning tool. The essentials of this method are: First, the adjustment of the rollers so that their guiding or tangent points are located in the circumference of a circle whose diameter is equal to the outside diameter $(D+d)$ of the spring; second, the adjustment of the pitch "pusher," which determines the pitch; and third, slight tension on the wire in the tensioning tool. The coiling of a spring is usually done in a machine designed especially to suit the existing conditions, and

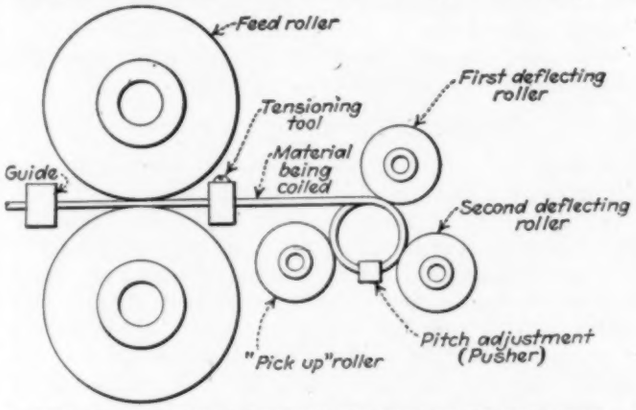


FIG. 2. COILING A SPRING BY MEANS OF ROLLERS

which ordinarily automatically controls the spring diameter and the pitch, and also cuts the springs at the proper length, which is "H" plus the length of the end loops for elongation springs and "h" for compression springs. Compression springs are also automatically compressed in order to make them "set." This method, which is suitable for production in large quantities, has the advantage of the "burnishing" operation, which will be explained more fully in the next paragraph.

(c) "Combination winding and coiling" consists in using an arbor set on the lathe centers as in "winding," the arbor being slightly less in diameter than the inside diameter $(D-d)$ of the spring. A tool called the "burnishing nose" and of the shape shown in Fig. 3, bends the material around the arbor in much the same way as in "coiling" a spring. Consequently, less tension need be applied to the material, which is the great

advantage both of this method and of the previous method over the heavy tensioning method used in "winding" a spring. A second advantage, also, is that

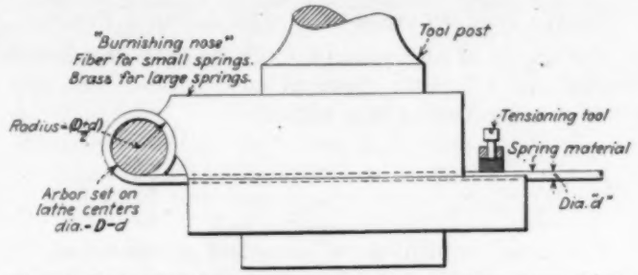


FIG. 3. COMBINATION OF SPRING WINDING AND COILING, OR "BURNISHING"

the spring takes a better "set," i.e., will not increase in diameter after being removed, which action had to be allowed for in the "winding" method.

Relative Fiber Stresses

The "burnishing nose" referred to performs an operation very similar to that of "coiling" in that it forms the material into a helical shape almost entirely by a bending stress plus a slight tensile stress, while in "winding" the forming is done mostly by a large tensile stress plus a bending stress. Now, consider the case where similar material and equal spring and wire diameters are used for both methods. Whether the spring coil be formed by winding or coiling, it will require very nearly equal stresses on the outside and inside fibers to produce the requisite "set." For the sake of illustration, let us assume that it requires a stress of 100,000 lb. per square inch.

The value of this stress may be shown graphically by $A'A$ in Fig. 4, which fiber is in tension, or by $B'B$, which is in compression. The geometrical axis is coincident with the neutral stress axis. Now, when a spring is formed with considerable tension in the wire, the stress diagram will be as shown in Fig. 5, where the fiber stress $A'A$ will be in the order of, say, 150,000 lb. per square inch and $B'B$ considerable less, say, 50,000 lb. per square inch. Assume, then, that 70,000 lb. per square inch is the elastic limit for tension and 60,000 lb. per square inch the elastic limit for compression of this wire. It is obvious, therefore, that the compressive stress $B'B$ (Fig. 4) in the first case will tend to hold the wire in the original form, while in the second case the compressive stress $B'B$ (Fig. 5) has no holding power whatsoever. On the other hand, the tensile stress $A'A$ in the second case exceeds the elastic limit more than $A'A$ in the first case, and will produce a certain amount of permanent strain or holding power, but not as much as a compressive stress would, due to the lower elastic limit for compression. Therefore, in the second case the entire stress on the inside fiber $B'B$ (Fig. 5) will be retroactive, tending to make the spring diameter increase after the removal of the tensile load.

Now in the case of "coiling" or "burnishing," a slight tensile load is applied to the wire, while the bending load is sufficient to produce the stresses shown in Fig. 4. The net result of this method is shown in Fig. 6, which shows that the neutral axis is but slightly removed from the geometrical axis. Assume $A'A$ equal to 110,000 lb. per square inch and $B'B$ equal to 90,000 lb. per square inch. This has the advantage over the first case (Fig. 4) of causing $A'A$ to exceed the elastic limit for tension to a greater extent, while the stress $B'B$ still exceeds the elastic limit for compression.

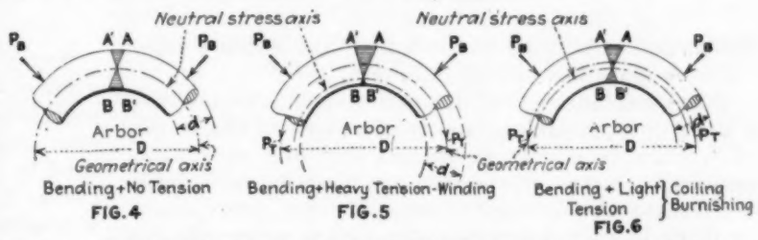


FIG. 4. STRESSES PRODUCED BY PURE BENDING, NO TENSION. FIG. 5. STRESSES PRODUCED BY BENDING AND HEAVY TENSION, AS IN WINDING. FIG. 6. STRESSES PRODUCED BY BENDING AND LIGHT TENSION, AS IN COILING OR BURNISHING

Therefore, from the foregoing discussion it is quite obvious that "coiling" and "burnishing" (Methods *b* and *c*) will produce a better or more permanent set in the forming of a helical spring, and are therefore recommended.

Very large springs may be formed by heating the bar to a temperature sufficient to enable winding it on an arbor easily, and then plunging the *entire* spring into an oil bath quickly, after which it is tempered.

Initial tension: Sometimes an elongation spring is required to have an initial tension, i.e., the application of a certain load before any deflection takes place. These springs are made by twisting the coils against each other, so that the initial tension is held in equilibrium by a close-wound spring equal in length to h_1." The method of forming these springs may be called the "double winding" method and is shown very briefly in Fig. 7(a). The size of the auxiliary arbor A and the angle its axis makes with the axis of the main arbor M determines the amount of initial tension and initial twist or deflection. This method may be used for making compression springs also, as shown in Fig. 7 (b), where the wire is fed from the opposite side of the auxiliary arbor. Here the amount of pitch or spacing between the coils is dependent on the size of the auxiliary arbor and the angle its axis makes with the main arbor axis. For accurate results, the "burnishing" tool should be used on both the main arbor and the auxiliary arbor.

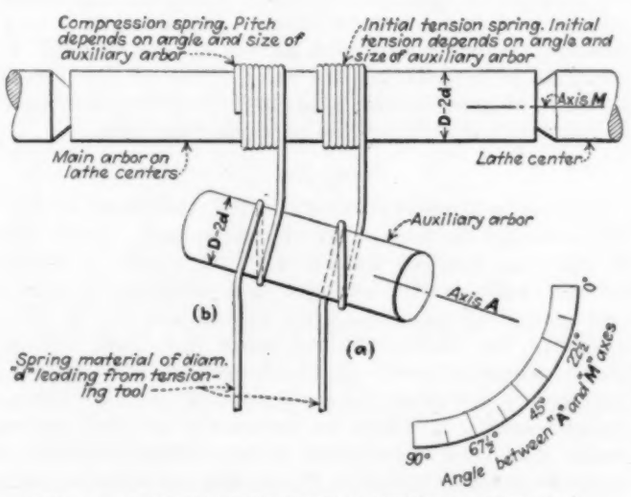


FIG. 7. "DOUBLE-WINDING" A SPRING, USING AN AUXILIARY ARBOR

In forming a helical spring, the diameter "D" should not be less than five times the diameter "d" of the wire or bar and preferably seven times. The reason for this is that the fiber stress "S" produced under these conditions is complicated and too near the rupture point for even materials of high strength.

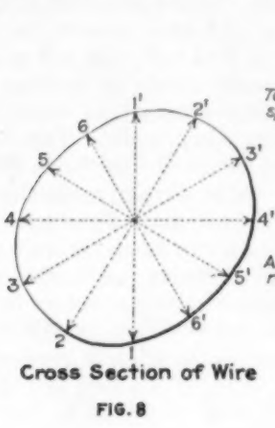


FIG. 8

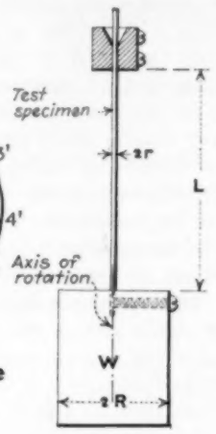


FIG. 9

FIG. 8. MEASUREMENTS TAKEN TO DETERMINE THE MEAN DIAMETER OF A WIRE. FIG. 9. TORSIONAL PENDULUM FOR DETERMINING MODULUS OF ELASTICITY

When considering "H," elongation springs should have a slight inappreciable initial tension, so that the length "H" will give correct deflections and pressures. Annealing by means of the cold air blast method should not destroy this initial tension. The end loops should be made in such a way that the pull is along the axis of the spring. In compression springs the length "h" may change after the first compression, which gives it the "set," and may also change if the finished spring is subjected to heat treatment. For this reason, compression springs should not be cut to the length "h" until after given these two treatments.

Although a spring is safe if the percentage of elongation or depression and the spring index $\left(\frac{D}{d}\right)$ are within the limits prescribed by the material index, yet for elongations or depressions exceeding 300 per cent the deflections are not exactly proportional to the loads, due to the fact that the deflection formula becomes appreciably only approximate.

The number of turns "N" should be specified to conform with the length H, and should be specified only for turns in active use. Exact uniformity of pitch is not so important, provided an unsafe load is not thrown on any one coil.

Thus, the variations in the diameters D and d will cause the spring criterion to vary by about 6 or 7 per cent, provided that all factors are controlled as outlined in these articles; but the value of this criterion will usually be more than the true value, which is on the safe side. For the deflection formula, a variation of about 8 per cent may be expected in the required pressure at a certain point in the spring's travel, provided that all factors are controlled to within certain limits. More accurate springs may be made by testing them out and rejecting those which fail to meet the requirements.

Great care should always be taken not to damage by marking or scratching the wire material. Coarse tools should not be used, and the tensioning tool and burnishing tool should have a brass or fiber contact. Also, care should be taken when grinding or squaring the ends of compression springs.

Sample Investigation of Material for a Spring

Music wire of high quality, 0.020 in. in diameter and having the following chemical composition, was procured for the making of a spring:

	Per Cent
Carbon	0.85
Manganese	0.45–0.50
Sulphur	0.02
Phosphorus	0.025
Silicon	0.15

This steel, which is of eutectoid composition, or thereabouts, is evidently favorable for spring material, as it should have a very high elastic limit and ultimate strength. A study of the cross section of this wire through the microscope, using a magnificatian of 200, reveals the fact that this steel has a very fine and closely grained structure. Consequently, due to this homogeneous structure, we would expect a uniform value for the modulus of elasticity throughout the entire spring made from this material. The utmost precautions were taken to keep the wire and the springs made from it free from corrosion by packing them in chalk dust.

Test No. 1

Ten 8-in. samples of this wire were calipered and an average diameter for each determined. Tensile loads were then applied to each sample in increments of 10 lb. each until the wire ruptured, while an extensometer was used to measure the elongations. From the elongation curves plotted and the average diameter, the ultimate strength, the elastic limit, and the modulus of elasticity were computed for each sample. The figures thus obtained are quite consistent, so that the averages for the ten samples are considered sufficiently accurate for practical use. Therefore, the value of the modulus of elasticity E is found to be 33,300,000 lb. per square inch, the value of the elastic limit, 272,000 lb. per square inch and the ultimate strength equal to 338,000 lb. per square inch. It is quite evident, then, that the quality of this wire is high.

From the value of the elastic limit of 272,000 lb. per square inch for tension, the value of the elastic limit for torsion may be taken as 50 per cent of this or 136,000 lb. per square inch. Theoretically, this value should be slightly greater and may be computed from the following formula: $S_{Torsion} = \frac{1}{2} S_{Tension} - \gamma S_{Tension})$, which was derived in a previous article. However, as a safe maximum value rather than an exact value for "S" is required, we may reduce the value of the torsional elastic limit, as given above, to about 110,000 lb. per square inch and call it "S" for this particular material.

Test No. 2

Having secured the value of "S," the value of "G" the torsional modulus must be determined. Using one of the four methods described in the previous article, 10 8-in. samples of wire were each subjected to a tensile load of 70 pounds and the elongations noted. The diameter was measured just below fine black lacquer marks placed at every half-inch section on each wire, both before and after the application of the load. These measurements, in which an accurately adjusted micrometer was used, were taken at six different places at any one mark, as shown in Fig. 8, and the mean of these six measurements considered as the diameter of the wire at that mark.

The average of the differences in these diameters before and after the application of the load for the ten samples is 0.00005 in. The average elongation is 0.060 in. and the average diameter 0.0194 in. Therefore, the factor of lateral contraction λ may be determined by the following formula:

$$\lambda = \frac{d_1 - d_2}{\epsilon \times d_1}$$

Where d_1 = diameter before load is applied,
d_2 = diameter after load is applied,
ϵ = unit elongation,

$$\therefore \lambda = \frac{0.00005 \pm}{0.007 \times 0.0194} = 0.375 \pm$$

Now from formula (5) derived in a previous article,

$$G = \frac{E}{2(1 + \lambda)} \qquad (5)$$

Hence by substitution we get,

$$G = \frac{33{,}300{,}000}{2(1 + 0.375)} = 12{,}000{,}000 \text{ lb. per sq.in. } \pm 5\%.$$

As the results of the foregoing experiment were not accurate, nor consistent enough (due to the wire being so small), it was decided to determine "G" by another method. This method was not recommended for small wire in the previous article.

TEST NO. 3

Method No. 3 which was outlined in the previous article was used in this test. Formula (4), used in connection with this method, is as follows:

$$G = \frac{2\pi IL}{t^2 r^4} \qquad (4)$$

One end of a sample of wire was pinched between two brass plates having the wedge shape shown in Fig. 9. From the other end, a solid brass cylinder 1.53 in. in radius and weighing 8.59 lb. was suspended. The moment of inertia of a solid cylinder "I" with respect to its axis of rotation is equal to $\frac{MR^2}{2}$, where M is the mass and R the radius. But $M = \frac{W}{g}$, where "g" equals the acceleration of gravity, which if substituted gives $I = \frac{WR^2}{2g}$. Now, substituting this value in (4) we get

$$G = \frac{\pi W R^2 L}{12 g t^2 r^4}$$

or, $$G = \frac{0.163693\, L}{t^2 r^4}$$ for the cylinder used.

By varying the length L for each of the five different samples of wire tested and noting the time of oscillation when the weight was turned through various amplitudes about the vertical axis, the following results were obtained:

(1.) The value of $\frac{L}{t^2}$ was very close to 0.625 for over 100 measurements made of L and t.

(2.) The average value of the radius r of the five samples of wire was 0.0096 in.

Therefore, by substituting these values in the above formula, we get

$$G = \frac{0.163693 \times 0.625}{(0.0096)^4} = 12{,}100{,}000 \text{ lb. per square inch.}$$

as the value of the torsional modulus.

Comparing this value of "G" with the value determined by the previous method we find a very small difference, which, however, does not mean that the former results were accurate, but that they serve to give better confidence in the good results obtained in this test.

TEST NO 4

Having determined the value of "S" equal to 110,000 and "G" equal to 12,100,000 lb. per square inch, which makes the material index $\frac{(\pi S)}{G}$ equal to 0.0285, a spring was designed and made up in order to verify these figures. A compression spring of the following dimensions was deflected by varying pressures, and a curve then plotted:

Average diameter "d" of wire	= 0.0194 in.
Mean " "D" " spring	= 0.1310 in.
Free length of spring "h"	= 1.41 in.
Number of turns "N"	= 32.0

The spring criterion $\left(\frac{h - H}{H} \times \frac{d^2}{D^2}\right)$ for this spring is equal to 0.0274, which is just less than the material index.

The curve plotted resulted in a straight line. Measurements of the deflections were very carefully made by loading the spring until a certain electrical contact was made, which indicated a definite length of travel. By selecting any pressure and corresponding deflection from the curve, say 0.555 for the deflection and 26.456 ounces for the pressure, and substituting in the ordinary deflection formula

$$G = \frac{P D^3 N}{2 F d^4}$$

or, $$G = \frac{26.456 \times (0.131)^3 \times 32}{2 \times 0.555 \times (0.0194)^4} =$$

11,900,000 lb. per square inch. Four other springs, tested in a similar manner, gave an average value of "G" equal to 11,800,000 lb. per square inch. "G" computed from this formula is low, due to the approximation made in deriving the above formula, and to difficulties in making measurements on small springs. However, the per cent difference is very small.

TEST NO. 5

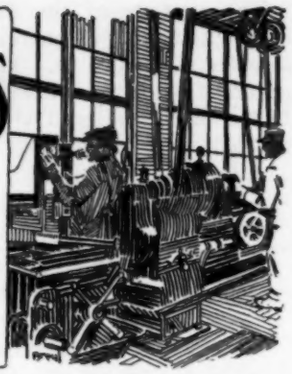
Twenty-four springs similar in size to the springs used in test No. 4 were made up, particular precautions being taken to protect the wire from moisture by covering the hands with chalk dust. Twelve of the springs were copper plated, as outlined in the previous article, i.e., by plating with nickel previous to copper plating.

The twenty-four springs were then submitted to a fatigue test, being operated at the rate of once per second through the maximum deflection. After 2,000,000 operations three failures occurred, which is quite negligible, considering that the failures occurred after the 800,000th operation. If the unloading line had been plotted on the elongation chart for this wire, it probably would have very nearly coincided with the loading curve, showing 100 per cent recoverance, or ability of the material to withstand fatigue.

This test then shows that the material index as determined by the previous tests was a correct maximum limit for the spring criterion, which was very close to it in value. It shows, further, that because of the precautions taken to protect the wire from corrosion and embrittling due to plating, the treatment did not materially affect the value of the material index, thereby not decreasing the useful and safe working range of the spring.

MODERN PRODUCTION METHODS

By
W P. Basset
of
Miller, Franklin, Basset & Co



XVI—Getting the Overhead into the Finished Product

Methods of Checking Costs—Distribution of Various Charges to the Proper Departments—Machine Hour Rates

IT WAS once the practice to keep cost accounting entirely separated from the general accounting of a business, with the result that the information derived from the two sources was more apt than not to differ widely. Since correct costs depend upon charging every expenditure shown by the general books to each item of the product in the proper proportion, I have throughout this series shown how each item of costs is handled, not only in the cost system but in the general books.

Unless the cost system ties in frequently with the general books of account we have no check on the accuracy of the costs and the system would be in effect the inaccurate and old-fashioned single entry system.

Fig. 77 is a trial balance taken from the books after consideration has been given to the balances which existed in the inventories when the books were opened at the beginning of the year. These balances were purposely omitted in the ledger pages which have appeared so far, in order to prevent confusion as subsequent items were entered. This trial balance shows that the manufacturing expense account has a debit balance of $14,582.86, which is the controlling figure. When all of the contributory department expenses have been distributed, the total expenses of the productive departments must balance with this figure after it has been modified by journal entries. The journal entries will be discussed as the need for making them appears. A complete list of them with the amounts of each is given in Fig. 78.

In Part XIII, I discussed theoretically the bases on which the various contributory departments' expense can be distributed to the productive departments, choosing those methods best adapted to the needs of this particular shop. I shall now describe the actual clerical steps by which all of the overhead is gotten into the product.

On the expense analysis of the boiler department, shown in Fig. 79, the total direct expense is seen to be $791.05. To this amount have been added $3.29 for lighting and $142.27 for fixed charges, making a total boiler expense of $936.61. It seems well to explain here that for each department the direct expense is totalled separately from the fixed charges and the shares of the expense of other departments. The direct items—sometimes called the controllable expense—are those which are under the control of the one in charge of the department, and for which he can be held responsible. He cannot, however, be held responsible for a rise in the other items which are allocated to him by higher authorities.

Experience having shown us that in a plant of this kind about 90 per cent of the steam goes for power and 10 per cent for heating the buildings, we make the distribution in this proportion at the bottom of the boiler

TRIAL BALANCES
as of
January 31

	Dr.	Cr.
Material purchased finished	$25,232.02	
Lumber packing material	923.80	
Forgings and castings	54,274.62	
General stores	6,126.30	
Goods finished and in process	245,463.56	
Buildings	452,601.78	
Bar stock	27,341.13	
Hardening and carbonizing material	4,300.56	
Fuel	5,371.29	
Machinery	372,380.42	
Accounts payable		324,136.77
Iron and steel	25,137.47	
Cash	95,127.30	
Accounts receivable	275,129.30	
Real estate	50,000.00	
Surplus		325,966.52
Capital stock		1,000,000.00
Manufacturing expense	14,582.86	
Reserve for dep. buildings		3,711.17
Machinery insurance		112.50
Tax machinery		81.58
Building insurance	1,387.80	
Tax buildings		101.75
Selling expense	49.55	1,319.47
Reserve for dep. machinery		1,319.47
	$1,655,429.76	$1,655,429.76

FIG. 77. TRIAL BALANCE SHEET

department expense analysis. The 90 per cent is at once added to the power department expense analysis, while the correct proportion of the heating charge for each department in the plant is worked out on the basis of floor space, on the sheet shown in Fig. 80 for "heat distribution." The total of these amounts must of course be $93.66, which is 10 per cent of the total boiler department expense. These amounts are posted to the expense analysis of the various departments, absorbing all of the $93.66.

On the power department expense analysis you will find the $842.95 which is the 90 per cent of boiler expense carried forward to the power department. The "power distribution" sheet in Fig. 90 analyzes the power consumption of all departments and gives the amount to be charged against each department. The total of these amounts must be $1,198.76 to check with the total expense developed for the power department.

The expense analysis of the office department shows a total charge of $1,304.02 which has benefited both the manufacturing and the selling ends of the business. We decided to charge 60 per cent of the total office expense to general factory and 40 per cent to selling, inasmuch as a study of the activities of the clerks and executives showed that their time was divided roughly in that proportion. The distribution is shown at the bottom of the office department expense analysis.

Here it becomes necessary to make the first journal entry which consists of debiting the "selling expense" ledger account with $521.61 and crediting the "manufacturing expense" ledger account with $521.61; this being the share that the selling end of the business has to bear of the total office charge.

In Part XIII, we explained that the "general factory" department is simply the gathering ground for those items of overhead expense which benefit the shop as a whole rather than any specific department. The total of these items gathered on the general factory expense analysis is $2,826.37. We decided in Part XIII that for this shop the productive hour would give the fairest basis on which to charge this expense to the productive departments. So we divide the total general factory expense by the total productive hours of the plant, giving us a charge of 12.09 cents per productive hour, which will absorb the general factory charge.

Sometimes it is desirable to spread this expense as a percentage of the productive labor. Therefore, on the expense analysis we have worked out this ratio as 25.91 per cent.

Perhaps at this point it is well to call attention to the fact that in this series of articles dealing with costs we have purposely made our figure ridiculous so far as ratios, rates and amounts are concerned. This is so that there will be no liklihood of our chancing to assume figures close to those of some client who might feel that we were giving away confidential information. Therefore, it is unsafe for any reader to assume that the actual figures used in these articles can be used as a standard by which to check the performance of his own shop.

In Fig. 80 is shown a sheet called "distribution general factory," listing the department and showing for each the number of productive man hours in that department. Now, the productive man hours in any department, multiplied by the 12.09 cent rate for the general factory gives, in the last column, the share of the general factory charge which each department must bear. These are now carried forward to the expense analyses of each department. This absorbs all of the expense of the contributory departments—except for the toolroom—into the productive departments.

The toolroom expense is often perplexing. To get the widest application I have chosen to consider the medium size shop in which the toolroom takes care of the machine repair work and may, in emergency, do productive work upon the product that is sold. Its expense analysis is worked up in the usual way and we find that it shows a total expense of $881.78. The labor in the toolroom can be charged out to the other departments on the basis of the work actually performed for them, just as the labor of a productive department is charged to the product. In fact, we may properly look upon the toolroom as an outside concern which we employ to manufacture tools and do miscellaneous repair work for us. I think that if we get this point of view, the point which we seek to bring out will become clear.

So we find that in this month the toolroom put in 978 hours which should be charged to other departments as shown on the "toolroom distribution," Fig. 80. This

SUMMARY OF JOURNAL ENTRIES
UP TO THE MAKING UP OF EXPENSE ANALYSIS

	Dr.	Cr.
Manufacturing expense	$5,463.97	
Machine depreciation		3,711.17
Building depreciation		1,319.47
Machine taxes		81.58
Building taxes		101.75
Machine insurance		112.50
Building insurance		137.50
Monthly charge for the above; see fixed charge sheet.		
Selling expense	1.92	
Manufacturing expense		1.92
Amount of light for the month charged on entry to Manufacturing Expense, but on distribution found to belong to Selling Expense.		
Selling expense	21.82	
Manufacturing expense		21.82
Amount of Fixed Charges belonging to Selling Expense; see Fixed Charge Sheet.		
Manufacturing expense	5,307.53	
Goods finished and in process	10,615.06	
Payroll		15,992.59
To transfer respectively the non-productive labor and the productive labor to the above accounts.		
Manufacturing expense	525.00	
Fuel		525.00
Coal used during the month.		
Manufacturing expense	1,456.73	
Hardening and carbonizing material		124.65
Lumber and packing materials		371.80
General stores		960.28
Materials used for expense purposes during the month.		
Selling expense	20.25	
Lumber and packing materials		10.20
General stores		10.05
Materials used for Selling Expense during the month.		
Goods finished and in process	46,765.80	
Castings and forgings		21,781.38
Bar stock		13,613.85
Iron and steel		9,885.03
Lumber and packing materials		2.50
Material purchased finished		1,348.18
General stores		134.86
Above being the withdrawals from the inventories and put into process during the month.		
Buildings	210.11	
Bar stock		35.01
Iron and steel		175.10
Amounts withdrawn from above inventories during the month for the benefit of the buildings.		
Machinery	409.15	
Bar stock		215.15
General stores		193.99
Amounts withdrawn from above inventories during the month for the benefit of the machinery.		
Selling expense	521.61	
Manufacturing expense		521.61
Share of office chargeable to Selling Expense.		
Manufacturing expense	8.36	
Profit and loss due to abnormal expense		8.36
Difference between the actual toolroom rate and normal rate on toolroom charge to General Factory.		
Buildings	27.33	
Manufacturing expense		27.33
Toolroom labor and expense charged to buildings.		
Machinery	244.22	
Manufacturing expense		244.22
Toolroom labor and expense charged to machinery.		
Selling expense	450.00	
Goods finished and in process		450.00
Shipping Room labor that was posted to Goods Finished and in Process, to charge it to Selling Expense.		
Selling expense	853.55	
Manufacturi g expense		853.55
To transfer the shipping expense to selling expense.		

FIG. 78. SUMMARY OF JOURNAL ENTRIES UP TO THE MAKING UP OF EXPENSE ANALYSIS

gives us a complication, for the general factory department had service from the toolroom to the extent of 85 hours. But on the toolroom expense analysis there is a share of general factory amounting to $118.24. Without

recourse to higher mathematics, it is obviously impossible to close either one of these departments until the total expense of both has been ascertained. As we maintain a cost system to get us commercial results and not as a gymnasium for mental acrobatics, we use a method which gives us sufficiently accurate results at little effort. We assume a standard or normal rate per hour, which in this case is $1. On the general factory expense analysis is a charge of $71 covering 85 hours time of a toolroom workman which was made from the service cards of the toolroom workmen. The item of "toolroom expense (normal)" is the charge for 85 hours work done by the toolroom and charged for at the normal rate of $1 per hour.

As soon as the general factory rate has been developed and the toolroom's share charged to it on this basis, the actual rate for the toolroom is developed. This gives an actual hourly rate for the toolroom of $0.90 16/100.

On the toolroom distribution sheet, Fig. 80, the toolroom expense charge for each department is worked out by multiplying this actual hourly rate by the number of chargeable hours. For general factory this gives rise to a discrepancy, for on the distribution sheet the general factory's share of the toolroom expense is $76.64, while on the general factory's expense analysis it was charged with $85 at the normal rate. Now, were we to leave things in this condition we would be out of balance with the controlling ledger account by the difference between $76.64 and $85, which is $8.36. This is corrected with a journal entry debiting manufacturing expense and crediting "profit and loss due to abnormal expense" with $8.36. In the next article, we will discuss this question of normal and abnormal expense in detail.

The toolroom distribution sheet shows 17 hours charged to the buildings, and 140 hours to machinery. These are not expenses of operating, but are rather asset items, being additions to existing buildings and machines. We, therefore, relieve the manufacturing expense account by means of journal entries debiting buildings with $27.33 the sum of toolroom labor and expense, and machinery in the same way with $244.22 and crediting manufacturing expense with similar amounts. The toolroom charges to other departments together with these charges to assets absorb all of the $881.78 toolroom expense except the $551.78 covering the 612 hours put in as productive labor on the concern's regular product. This $551.78 will be released in the final cost of our product, just as is the expense of any other productive department.

The expense of all contributory departments now rests in the productive departments, each of which has taken its fair share. The next step is to get the expense of the productive departments into the product.

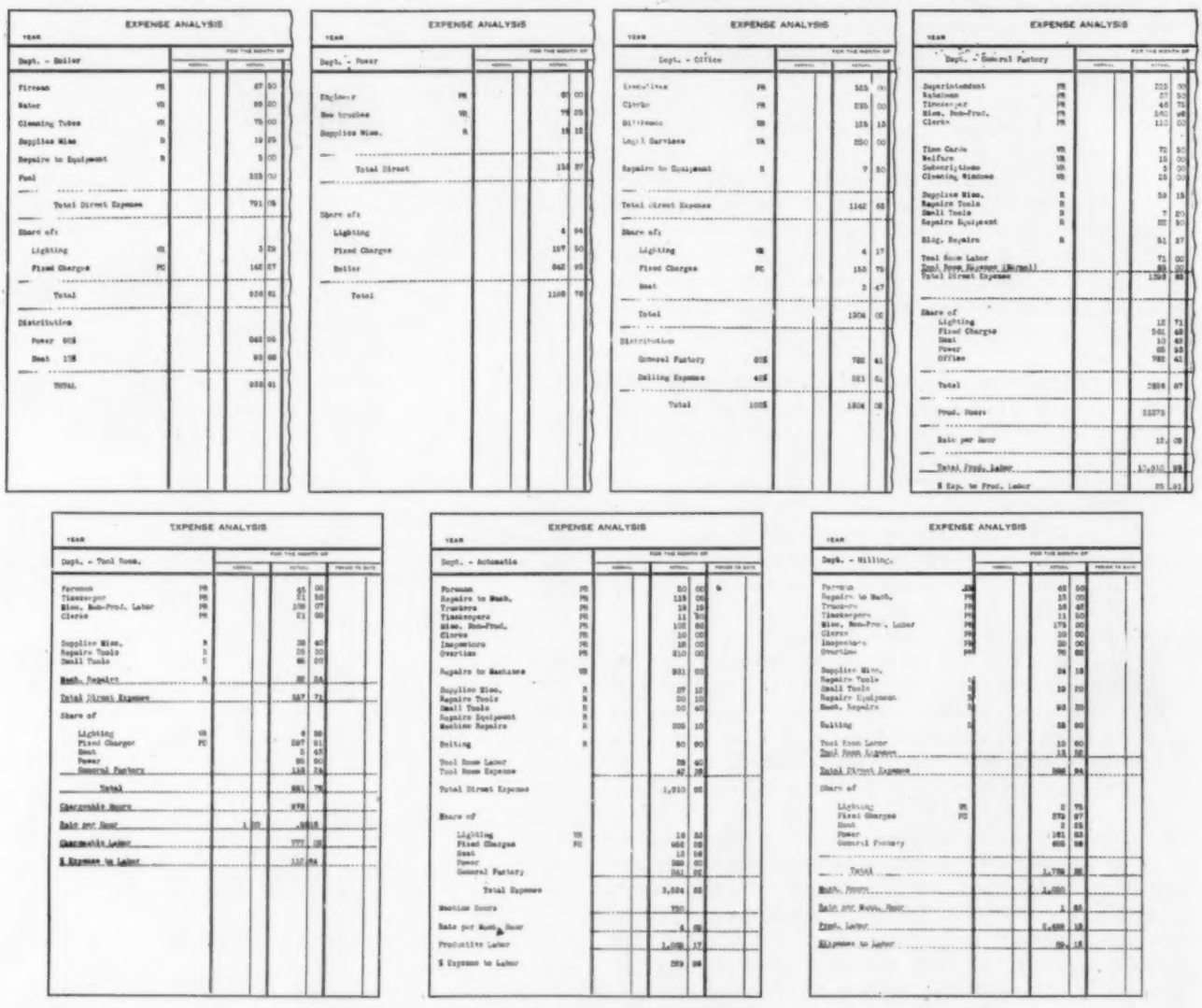


FIG. 79. EXPENSE ANALYSES

So let us now consider the expense analysis of the automatic department. In earlier articles we have described the items marked V.R., P.R., and R. The toolroom labor and expense have just been discussed. Under the heading of "shares," you will note light, heat, power, fixed charges and general factory, the origin of which we have discussed in this article. The total expense is thus seen to be $3,524.63, and a total of 750 machine hours have been put in by the department. By dividing the total expense, $3,425.63 by the 750, we get a rate per machine hour of $4.69. This, then, furnishes a basis on which the product processed in the automatic department can be justly charged with the department's expense. From a factory report, we learn the number of hours that have been charged against each order, part or job and to get the actual cost for that month multiply them by the $4.69 rate. Old-fashioned cost systems would use that as the cost; the best modern practice is to use instead of the $4.69, a normal rate and carry the difference between the normal and actual to profit and loss. This will be explained in detail in a later article.

This is a good place to warn the reader that the machine hours of a department are not necessarily the same as the hours reported on the workman's service card. It is, therefore, necessary that the correct method of keeping time be used in the automatic department. The method to choose will depend upon whether the work is continuous and whether it is possible to keep the same men regularly on the same groups of machines. If, as is usually true, the work is not continuous, it is best to use a time card for each machine, on which is reported the number of machine hours that the work took from the beginning of the set-up time until the machine stopped running on that part. The men in the automatic department then report their time as operators or set-up men but not against any individual job. A labor cost per machine hour is thus developed and handled as an over-all labor charge. For the automatic department, this plan will do, as the operators differ but slightly in skill and rate. Skill enters mostly in making the set-ups.

The need for charging time in this way is due to the peculiar conditions which exist in the automatic department. The man who ordinarily runs say four machines may find some morning only three machines set up and ready to run. Half an hour later, one of these machines may finish and the fourth be ready for him to start. During the week he may run anywhere from one to four machines at a time. It would entail needless clerical effort to report his time and to get the labor rate. If in a special case it seems advisable to report the man's time exactly against any part, it can be done accurately. If he normally runs four machines, his time is applied

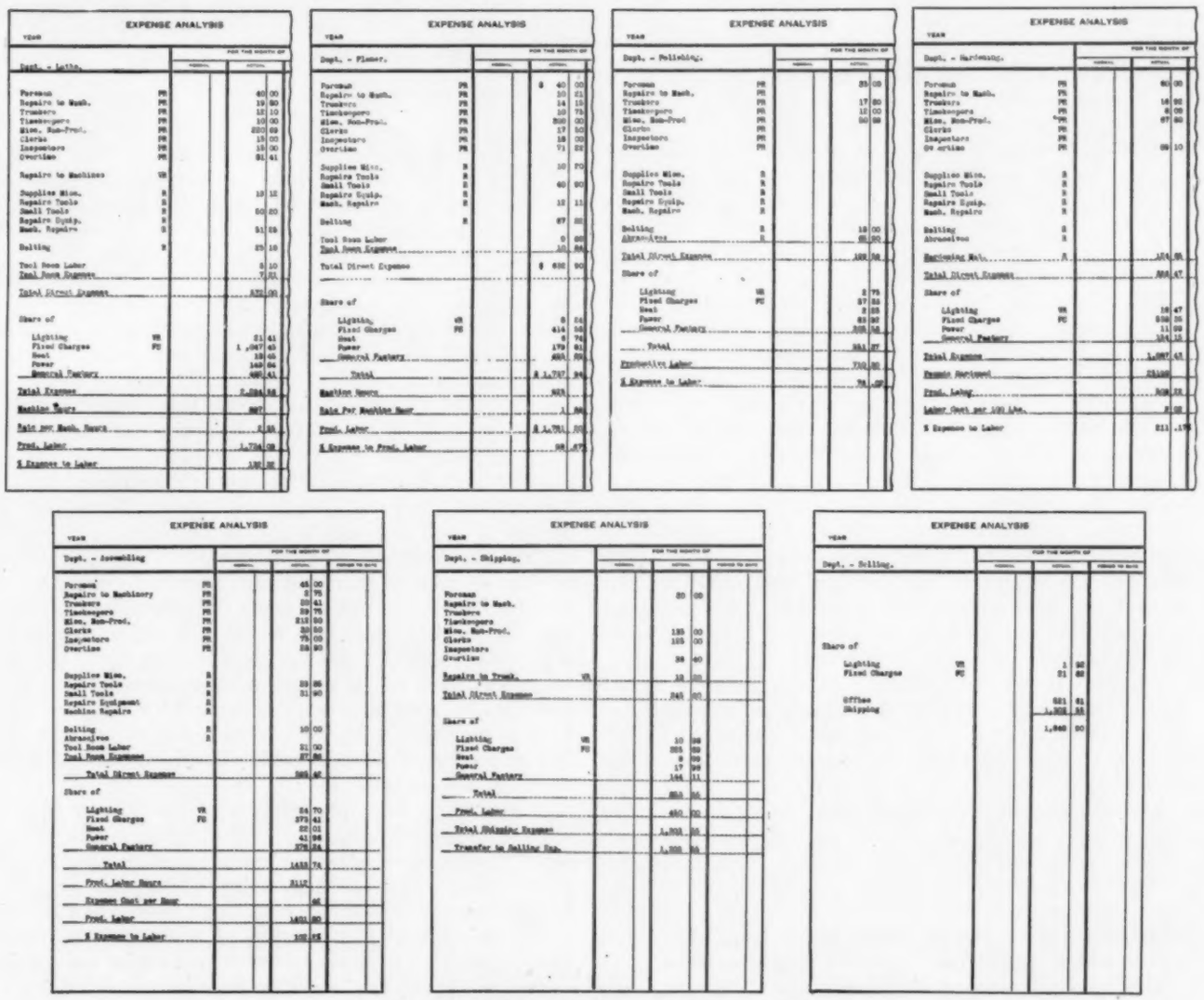


FIG. 79. EXPENSE ANALYSES (CONTINUATION OF)

one-fourth to each. Then when one of his machines is down a time card is turned in for that machine as being idle and the labor cost at one-fourth the man's rate is thrown into the department's expense. It would be obviously wrong to divide the man's rate among the machines he actually happens to be running at any time. Suppose for example, a man gets 60 cents an hour and normally runs four machines each of which is charged with a labor cost of 15 cents an hour. If, however, two machines went down, the parts on the two machines which are still operating would be charged at 30 cents an hour, thus penalizing a part for a fault of management. The better way, where labor cost must be charged to the product direct is to throw 30 cents into the overhead of the department and charge each of the machines which are operating with the customary 15 cents per hour for labor.

Either of these two plans can be adopted, although I believe it is best to use the labor cost per machine hour, as first described. So much for the method of accounting for time and arriving at the total machine hours in the automatic department. We also show on the expense analysis the productive labor dollars amounting to $1,068.17. This figure has been taken from the report described in Part XIV on labor. We are thus able to develop, for comparison but not for purposes of costing, a ratio of expense to productive labor of 329.96 per cent, as this is a figure that interests some executives.

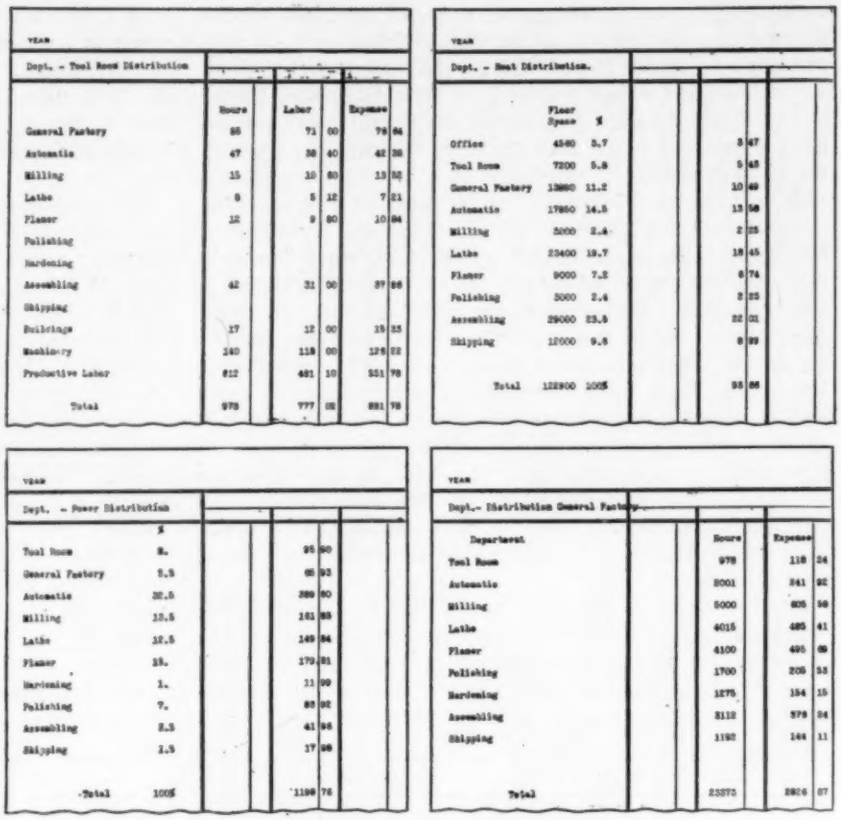


FIG. 80. DISTRIBUTION SHEETS

Before leaving the discussion of the machine hour rates as used in the automatic department it may be well to point out the fallacy of trying to make the machine hour rate include the labor of the machine's attendant. Perhaps where the true machine hour rate is very high, the charge for labor low and uniform throughout the department, the error may be negligible if the operator runs an unvarying number of machines. But I do not believe the practice advisable; for by combining the labor and expense into one rate, we are never able to analyze the cost into its elements. It is only by having these elements separate in the final costs that we can correct any deviation from the normal. When figures are lumped they are hard to separate; they might as well be buried.

The reason some cost departments include the workman's wage in the machine hour rate is, as a rule, to make it easier for them to estimate on new work; but like most short cuts of a lazy man the result is usually incorrect.

The expense of the milling department and of the lathe department is handled in exactly the same way as for the automatic. While in the automatic department the machine hours were greater than the man hours it would be well to note that the opposite condition sometimes exists in the planer department, for there a man and a helper may operate a single machine.

For several reasons the expense of the polishing department is not released on the machine hour basis. First, it is difficult to secure reports of the machine activity; second, the work to be performed is not so much a question of machine time as it is man time; and third, the polishing equipment is an aid to hand work rather than productive machine tools. We therefore release the expense of the polishing department upon the basis of the percentage of expense to productive labor. The labor cost in dollars and cents is accumulated against each order or part and the proper percentage, in this case 76.2 per cent, is added to absorb the overhead. Thus, a part on which $5 has been spent for polishing labor would absorb 76.2 per cent of $5 or $3.81 for expense.

Applying the expense of the hardening department to the product presents a problem different from any of the foregoing, although its expenses are gathered in exactly the same way. But it is impossible to charge the number of men or machine hours against each part or piece, for in one receptacle many different kinds of work may be packed and treated at the same time. To determine as nearly as we can the cost per piece for hardening, we get a report of the number of pieces which have gone through, together with their weight. In this month, 25,198 pieces were hardened at a productive labor cost of $509.22, which is a labor cost of $2.02 per hundred pounds.

If the hardening department is called upon to give several different treatments to different materials, a set of ratios may be set up based upon the number of pieces that could be treated by a furnace were the furnace assigned to that particular piece. This ratio would also consider the length of time that the pieces have to remain in the furnaces. These ratios are applied to the weight of the pieces that have been treated during the month and the number of unit pounds produced is

figured. So, if a piece has a unit value of 0.5, and a thousand of these pieces have gone through during the month, there would be 500 unit pounds and the general cost for the unit pounds for the hardening department is arrived at. Then, by multiplying the unit for the particular piece by its weight, the cost for that piece per pound is determined.

In the assembling department, because little of the work is done with machine tools, we release the expense by taking the percentage of expense to the productive labor dollar in the same way as in the polishing department.

Some cost accountants believe that it is more accurate to release the assembly department expense on the productive hour instead of on the labor dollar. While theoretically that may be true in some plants we must remember that we seek to develop our costs only so that they may serve us. When they are developed to an impractical and expensive degree of accuracy, the business becomes the slave of the cost system. Since experience shows that in the assembly department the hourly wage rate differs very little between man and man, the difference in the final result, by using either basis, is negligible. The productive payroll total is easy to get. So when we use that figure instead of the productive hours we leave the cost department free to devote its time to other and more useful work.

Debit		Credit	
Charge register	$1,829.63	Lights to S. E.	$1.92
Expense requisition	1,456.73	Fix. chg. to S. E.	21.82
N. P. labor	5,307.53	Selling from office	521.61
Fuel	525.00	Tool room chg. to bldgs.	27.33
Fixed charges	5,463.97	Tool room chg. to mach.	244.22
Abn. toolroom exp.	8.36	Shipping to selling exp.	853.55
			$1,670.45
		Balance	12,920.77
	$14,591.22		$14,591.22

Expense by Departments

Tool room	$551.78
Automatic	3,524.63
Milling	1,739.32
Lathe	2,294.56
Planer	1,737.94
Polishing	551.37
Hardening	1,087.43
Assembling	1,433.74
	$12,920.77

FIG. 81. MANUFACTURING EXPENSE LEDGER ACCOUNT

The total expense of the shipping department—$1,303.55—is charged in a lump to selling expense by means of a journal entry debiting selling expense and crediting shipping. The correctness of considering shipping as a selling expense is apparent when we realize that once the goods have been moved from the assembly floor, they are manufactured and the factory has ceased to be interested in them.

The Dividing Line

There has been no little discussion as to the dividing line between manufacturing costs and selling costs. To me it seems apparent that if the product of the factory can be taken directly from the assembly floor and installed in the plant of a next-door neighbor, the manufacturing cost is complete with assembly. We recall one order on which there was no crating cost or shipping cost, the finished product being placed directly upon the purchaser's trucks, uncrated, and carried away. But some of this concern's product was crated and shipped to other cities. Sometimes the sales department chose to sell other orders for export which required heavier crating and consequently a heavier shipping charge. There is no reason why the manufacturing department should be saddled with costs due solely to the territory in which the sales department chose to sell.

The Manufacturing Expense Ledger Account

In Fig. 81 is shown the appearance of the manufacturing expense ledger account as it appears after all of the journal entries shown on Fig. 78 have been made. Each debit and credit entry shows its source. The difference—$12,920.77—has presumably been charged ultimately to some productive department and so has found its way into the product. This amount is therefore credited to manufacturing expense and debited to "goods finished and in process." To prove this figure, we list below the ledger account in Fig. 81 the productive departments with the total expense for each one as shown by the expense analysis. The total of these figures is $12,920.77, checking with the balance in the manufacturing expense account and so proving the correctness of our accounting for expense. Thus we know that every item of expense appears somewhere on the expense analysis and that finished product will absorb it all.

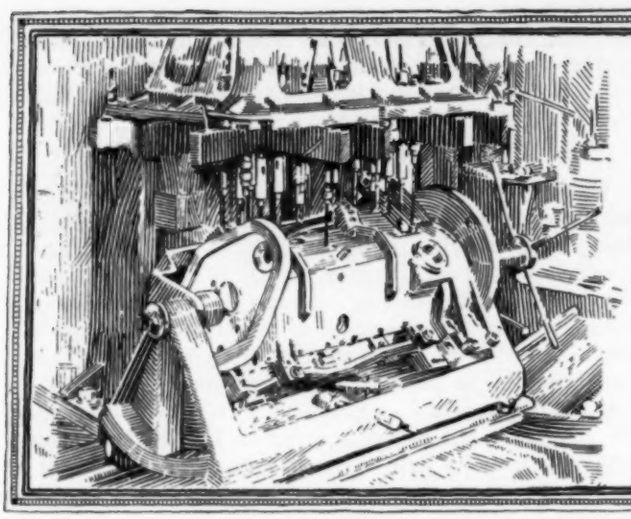
Knowing Why You Do Things

By Foster G. Jones

Referring to the third paragraph under the title "Know Why You Do Things," on page 565 of the *American Machinist*, wherein John Brent states that a machinist's job "is to make chips and that he does not need to know or understand the art of making drawings or figuring pulley or gear diameters," Mr. Brent is in my estimation absolutely wrong. The progressive machinist of today is getting a technical education, or is striving for more knowledge in the mechanical field, of which the machinist trade is such a minute part; and in this way he becomes a bigger asset to his employer and at the same time his capacity for making chips is not lessened.

About two years after I had started my apprenticeship my employers opened a trade school, giving the apprentices four hours a week out of the regular working hours to study mathematics, shop problems and mechanical drawing. This technical training of only four hours a week gave us the desire and aroused our ambition to go farther into the study of the subjects; with the result that we boys enrolled in night schools or correspondence schools and in this way received a liberal technical education which, combined with the practical experience, produces better machinists, better workmen and men better equipped to assume the duties of management. I have the highest regard for the industrial trade school and the company that gave me the opportunity to attend one.

My advice to the apprentice who is learning the machinist trade is to get all the knowledge he can of the different divisions that are in line with his trade; for the machinist trade is one of the starting points in the mechanical field. The machinist with a technical education has the foundation for making a better designer, engineer, or executive than the man who has only the technical side. So get busy—throw over the shifter and start making chips but do not forget to do a little diligent studying as you go along. It leads to bigger things.



Tool Engineering

By
Albert A. Dowd and Frank W. Curtis
President and Chief Engineer
Albert A. Dowd Engineering Co., New York City

Drill Jig Design Continued—Plain Clamps—Multiple Clamps—Hook Bolt and Wedge Clamps—Equalizing Clamps—Spring Plungers and Jacks

IN LOCATING a piece of work in a jig there are several points which must be looked after very carefully, in order that the piece may seat itself properly, may locate against portions of the casting which are not likely to vary and may be clamped securely without any danger of distortion. We have gone very thoroughly into the principles of locating the work in a previous article and we have taken up the various points which influence the design of a satisfactory jig. It must be borne in mind that there are numberless varieties of clamps which are used for various conditions

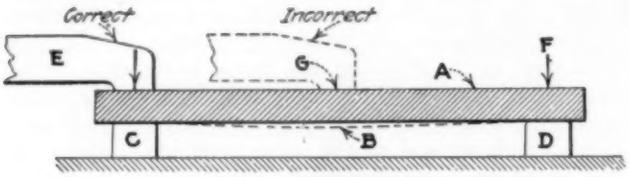


FIG. 36. CORRECT AND INCORRECT METHODS OF CLAMPING WORK

found in jig work in many factories throughout the country and that it is the selection of the proper type of clamp which shows the skill of the designer.

It is of primary importance that the clamp should not tend to force the work away from the locating points when pressure is applied to it. It very frequently happens that the bearing which the clamp obtains on the work is not quite what it should be and as a consequence the work is forced away from its bearing and locating points so that inaccuracy is the result. In handling delicate work it is important that the clamp should not be applied to any portion which is likely to spring out of shape or to be distorted, making the finished product inaccurate. Great care must be exercised when several clamps are applied on different portions of a piece of work. When a condition of this kind arises the clamps must be designed in such a way that they will equalize and distribute the pressure so that the work will not be tilted out of its true position.

In Fig. 36 are shown both correct and incorrect methods of clamping. With the work *A* set up on lugs at *C* and *D*, the clamping action should be directly over these points as shown at *E* and *F*. Pressure should never be applied at point *G* for the reason that it would be apt to distort the work so that it might take the position *B*. This is a principle in designing but it does not apply to every case. We might easily imagine a heavy piece of work which could be clamped at *G* without causing any trouble. On light work the principle mentioned must be very carefully adhered to.

Several types of plain clamps which are commonly used in jig design are shown in Fig. 37. These clamps may be varied to suit particular conditions; that is they may be bent into different shapes and they may be operated by means of a screw in the middle or at the end, or they may be pivoted. They may be shaped to conform to a peculiar casting and they may have a very narrow bearing point where they come in contact with the work. In fact they may be changed to suit an infinite number of conditions. There is shown at *A* a clamp commonly called a U-clamp which is made of a single piece of steel bent into a U-shape. This type of clamp is frequently used in faceplate work, and on milling machines or boring mills, using a T-bolt as indicated. The clamp shown at *B* has a guide and support at *C* which prevents it from turning and getting out of position with the work when it is not used. The slot at *D* allows the clamp to be pulled back away from the work after the piece has been machined. This type of clamp is in common use for many varieties of jig work.

The clamp shown at *E* is similar to *B* but it is operated and guided in a different manner. The operator applies pressure to the clamp by means of the thumb-knob *F* on the end of the screw *G*. When releasing the work the screw slides along in the groove at *H*. This groove also serves to keep the clamp in alignment with the work when clamping.

Hook-Bolt and Wedge Clamps

At *A* in Fig. 38 is shown a hook-bolt clamp, frequently found very convenient for work not easily reached with the ordinary form of clamp, or when there is not room enough to permit the use of a plain clamp. In using a hook-bolt the heel *B* of the hook-bolt should be "backed-up" so as to take the pressure resulting when the clamp is tightened. Unless provision is made for taking up

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pressure there is a possibility that after continued use the hook-bolt may become bent so as to be practically useless. There is a tendency on the part of tool engineers to avoid the use of hook-bolts for this reason. We consider however that a hook-bolt is too useful an adjunct to be cast away. There is no objection whatever to a hook-bolt when it is backed up as shown by the upper view at *C*, as the strains of clamping are taken by this backing up lug so as to prevent any bending of the hook-bolt. When used in this way it will be found that many problems in clamping are simplified.

A wedge clamp is shown at *D* and although this form of clamp is not recommened for all work there are certain cases where it can be applied to advantage. The wedge is likely to distort the work for the jig, but in certain cases suitable provision can be made to counteract this distortion in the fixture and when this is properly done no difficulty should be experienced in its use. There are certain factories in the country which use jigs with wedges to a considerable extent. Sometimes a wedge is hung by a piece of closet chain and fastened to the jig so that it will not be lost. At other times the wedge is made extra long and pins are inserted at each end to prevent its being lost or falling out of the jig.

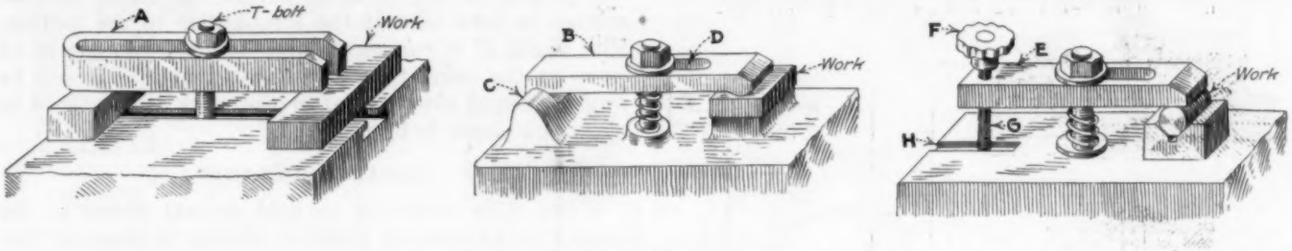


FIG. 37. TYPES OF PLAIN CLAMPS

A somewhat similar arrangement is shown in the clamp *G*. It is somewhat more elaborate but has the advantage of being made up in unit form so that it can, if necessary, be standardized and made up in quantities when the occasion warrants. The section *A-A* shows another view of the block with the sliding clamp in position in the block *H*. In operation the clamp is slid forward until it comes to rest over the pin *J*, after which pressure is applied by means of the thumbscrew. It is an excellent clamp which is easily operated and a form similar to it is used in great quantities by one very large manufacturing concern in the Middle West.

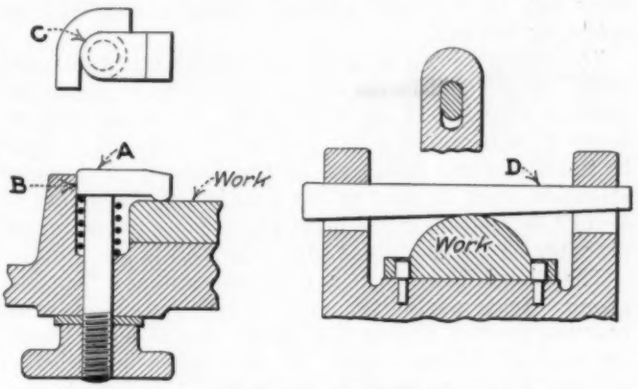


FIG. 38. HOOK-BOLT AND WEDGE CLAMPS

Suggestion for Clamping

Fig. 39 shows a group of representative clamps which can be applied to many varieties of work. These illustrations are diagrammatic and serve to show principles rather than careful details. The clamp *B* should not be used except when the work is located over pins or in some other way which prevents it from moving when the clamp is applied. This particular clamp is operated by a lever *C* and slides forward on the work as the stud *D* rides up on the angular hardened block *E*. A pin or nut on the end of the stud *F* takes the pressure of the clamp.

In order to avoid throwing a piece of work out of alignment when clamping, the scheme shown at *K* can be used. The work locates in a V-block and the pin *K* is adjusted by means of the collar screw *L*. This type of clamp applies the pressure directly to the work without any turning action.

The clamp shown at *M* is not used frequently, but there are occasions when a piece of work like that shown

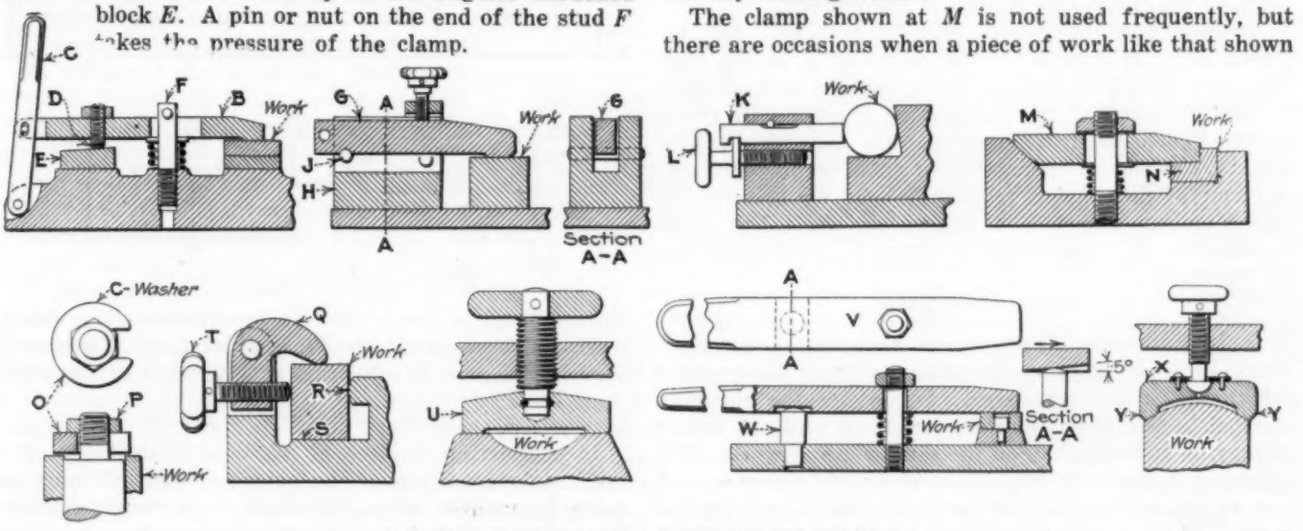


FIG. 39. GROUP OF REPRESENTATIVE CLAMPS

at *N* can be held to advantage by this type of clamp. The objection to it is that it must be loosened considerably in order to remove the work unless it is possible to slide the piece out of the jig end-wise.

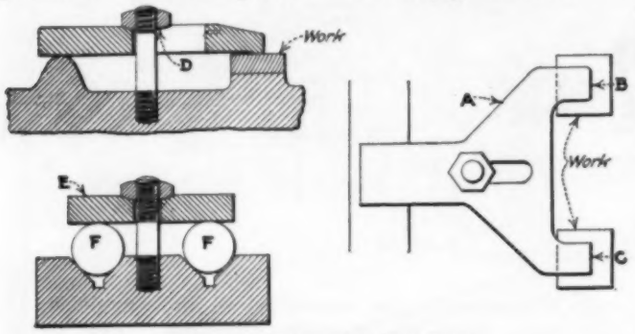


FIG. 40. MULTIPLE CLAMPS

The C-washer clamp shown at *O* is too common to need much description. In its simplest form it is a washer, cut out on one side so that when the nut *P* is loosened it can be slipped out readily. After this the work can be removed without difficulty and without removing the nut.

The clamp shown at *Q* is very useful on small light work. It is rapid in its action and serves to clamp the work at *R* and *S* at the same time. When the thumbscrew *T* is operated equal pressure is brought to bear in the directions indicated by the arrows. Particular attention must be paid to the position of the points of contact in relation to the pivot pin or more pressure will probably be applied in one direction than in the other.

The clamp shown at *U* is commonly called a "button" clamp. It is useful for small work and is so made that the portion *U* does not revolve but is hung loosely on the end of the screw so that when pressure is applied it adjusts itself to the work. The button may be made large or small according to conditions. It is a useful clamp and is found in many varieties of light jig construction.

A somewhat peculiar type of clamp is shown at *V* whose use is limited to finished work. Furthermore the work must be positively located in order that it may not be forced out of position by the action of the clamp. The operation in clamping is a swinging one as indicated by the arrow and the clamp is so made at the point shown in section *AA*, that a wedging action takes place between the clamp and the top of the pin *W*.

Another type of clamp, with a "button" end as shown at *X*, is similar to that shown at *U* except that the screw which operates it has a ball-end as indicated, in addition to which the clamp itself is made with three points *Y* separated 120 deg. so that the three points will bear with uniform pressure on a regular surface. A clamp of this kind is frequently used for holding the round end of a piston in automobile work, but other applications may frequently be found in the general run of jig work.

MULTIPLE CLAMPS

It is frequently necessary in clamping a piece of work to apply pressure simultaneously at two points which are widely separated. Sometimes the clamp is applied to two pieces at the same time while at others it may be at two points on the same piece of work. The example *A* shown in Fig. 40 is of a plain clamp spread out at the end so that the points *B* and *C* bear on the work. If the work has been machined it is unnecessary to provide anything more than a plain nut for clamping, but when the work is "in the rough" it is advisable to provide for inequalities by making the portion *D* in the form of a ball so as to permit the clamp to float enough to take care of the inequalities in the casting. The clamp *E* is commonly used to hold two pieces of work at the same time as indicated at *F*. It can be swung around side-wise after the work is machined to allow the pieces to be removed.

EQUALIZING CLAMPS

When it is necessary to hold several pieces at the same time or to apply pressure equally to three or four pieces at the same time, an equalizing clamp must be used. It is difficult to illustrate all of the various types of equalizing clamps which are used in jig work, but the principles underlying the design can be simply shown as in Fig. 4. In the first part of the illustration, the work consists of two pieces set up and clamped uniformly with the same screw at the same time. When pressure is applied by means of the screw *B*, there is a reaction through the lever *C* on the end of the pin *D* so as to force the clamp *E* down on the work. At the same time the re-action of the screw forces the clamp *F* down on to the work on that side of the jig with an equal amount of pressure.

In clamping four pieces of work a similar principle can be applied as shown at *G*. An equalizing lever is provided at *H*, pivoted at *J* where the leverage is applied. The pressure will be equal on the rods *K* and *L* and also on the clamp *M* and *N* so that the four pieces of work will be held with uniform pressure. The piece *Q* is clamped at both ends at the same time by means of the clamps *R* and *S* when pressure is applied at *T*. By the addition of various levers which must be properly pivoted it is possible to hold a number of pieces at the same time with equal pressure. It must always be remembered however that the power which is applied must be in direct proportion to the number of pieces which are to be clamped. An odd number of pieces is more difficult to clamp than an even number. In order to clamp three pieces at *G* instead of four, it is necessary only to provide a fulcrum at *X* in place of the work.

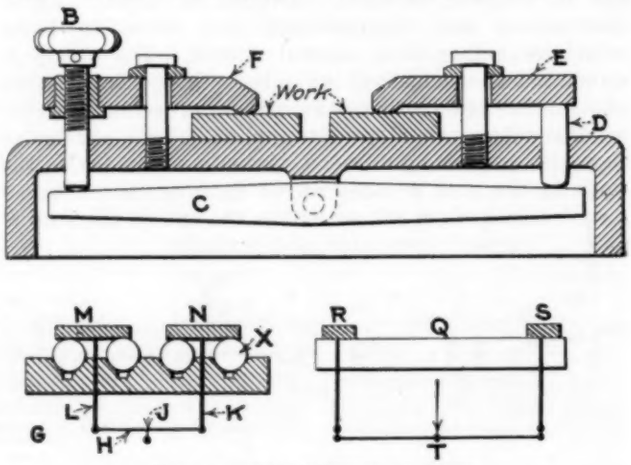


FIG. 41. EQUALIZING CLAMPS

SPRING PLUNGERS AND JACKS

In supporting a piece of work in a drill jig or a milling fixture some of the points of support must be made adjustable when the work is a rough casting. There are also a number of cases where jacks and spring

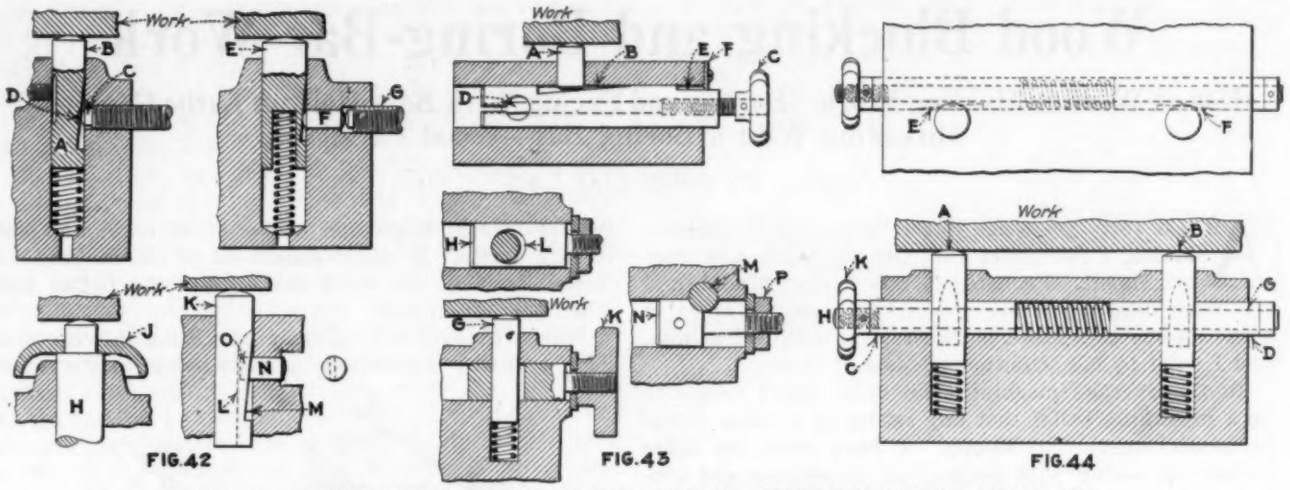


FIG. 42. SPRING PLUNGERS AND JACKS. FIG. 43. SPRING PLUNGERS AND JACKS.
FIG. 44. LOCKING TWO SPRING JACKS AT ONE TIME

plungers are used not only as a support but also to throw a piece of work over into a certain position. As a general thing spring jacks are made in such a way that they can be positively locked after they have reached a given position, so that there will be no chance of their moving under the pressure of a drill or milling cutter. The locking device used to hold the jack in position is of primary importance. Whatever method of locking is employed it must be such that there is no tendency to produce in the jack a hole or depression that might make it likely to assume after a time one position regardless of the position of the work against which it acts. Many ingenuous arrangements are used.

There is shown at *A* in Fig. 42 a common type of spring jack. Common as this type is, it is open to some objections. The plunger or jack *B* is usually pack-hardened so that it has a soft core. Therefore the action of the round end screw *C* has a tendency, after considerable use, to make a depression or pocket as indicated by the dotted lines at *D*. It is important that the angular surface against which the screw acts should not be too great. As a general thing about 5 deg. is sufficient. Speaking generally, we do not favor this type of jack on account of the objection mentioned.

The jack shown at *E* is very similar in general construction except that it has a pocket for the spring, so that it can be used in more confined fixtures. There is an added improvement also in that the locking pressure is applied through the soft brass member *F* acted upon by means of the screw *G*. There is no turning movement to the plug *F* as it comes against the jack, therefore, it is not likely to wear a perceptible depression.

The jack shown at *H* is practically the same in construction but it is provided with a shield *J* in order to guard against chips and dirt working down into the bearing and causing it to become loose. A protecting cover can be applied to almost any type of jack, but it is necessary only where the jacks are to be used for a very great number of pieces.

Another type of jack, shown at *K*, is milled on one side to form a support as shown at *L* and is also provided with angular surface *M* against which the plug *N* acts. The plug is made with a tongue so that it enters the slot *L* and prevents the jack from turning. The plug *Y* is also cut so that its angular surface bears against the angularity of the jack. There are cases when a jack of this kind may be found very useful.

In Fig. 43 an entirely different type of jack is shown at *A*. Such jacks are used extensively on light work such as typewriter and cash register parts. In the hands of a careful workman they will give good results but they can be made to distort the work considerably unless properly used. The jack is operated by pushing the plunger *B* forward by means of the knob *C*. The workman must know by the "feeling" that he has applied all the pressure necessary after which he turns the knob *C* slightly which causes the taper pin *D* to expand the end of the plunger *B* so that it locates firmly. The end of the plunger *B* is flatted off at *E* and a plate *F* is provided to prevent it from turning.

An excellent type of jack is shown at *G*. The binding or locating action is produced by drawing up on the plunger *H* by means of the knob *K*. The hole *L* shown in the upper view is usually made about $\frac{1}{32}$ in. larger than the jack. A jack of this kind will exert a great deal more pressure, but it is somewhat more expensive to make than some of the others mentioned. It is apparent that when considerable pressure is required the knob *K* can be replaced by a nut that can be tightened by a wrench.

Another type of jack is shown at *M*. It is similar in general construction to the one just described, but the location action is somewhat different. The plunger *N* is concave at *O* to the same radius as the jack so that when pressure is applied by means of a nut at *P* the friction against the jack is sufficient to keep it from slipping. There are other designs which can be used for spring plungers and jacks but the ones illustrated are more commonly used in jig work.

Fig. 44 shows a method of clamping two jacks simultaneously. Assuming that the jacks are bearing on the work at *A* and *B* in such a way that it is necessary to lug them at the same time in one operation, the method shown can be used to advantage in many cases and other developments can be made to suit particular conditions. In the case shown the locking devices consist of two sleeves at *C* and *D*. These sleeves are tapered slightly on one side at the points *E* and *F* to engage with the tapered portions of the jacks *A* and *B*. Rod *G* extends through both of the sleeves and is threaded at the end *H* so that when the knob *K* is turned the two sleeves approach each other and bring equal pressures to bear on the angular portions of the jacks. A nut can be used in place of the knob.

Wood Blocking and Boring-Bar Work

Use of Wood in Holding Work—Boring and Facing With Bars Held on Lathe Centers—Threading With a Boring Bar—Wood Parallels

BY JOHN SLOCUMB

ABOUT forty years ago in a jobbing shop in Bangor, Maine, I remember that the wood-pile was very prominent. Probably it was too prominent, and too much used, but there are certain uses for wood in some set-ups on a lathe, a planer, or a milling machine, and I want to call attention to some of them.

In the average machine shop today there seems to be a prevailing belief that any set-up on wooden blocks is unmechanical and sloppy. I have used the lathe largely in boring with boring bar on centers and consider this way, for many kinds of work, equal, if not superior, to any other.

In setting up some jobs in the lathe it is of course difficult to get the work central and in alignment, for the reason that it is bolted to the lathe carriage and there is no cross or vertical adjustment. I have seen a great deal of time wasted in setting up jobs on the carriage of the lathe by using parallels, V-blocks, knees and shims.

Suppose the piece to be machined is an iron casting

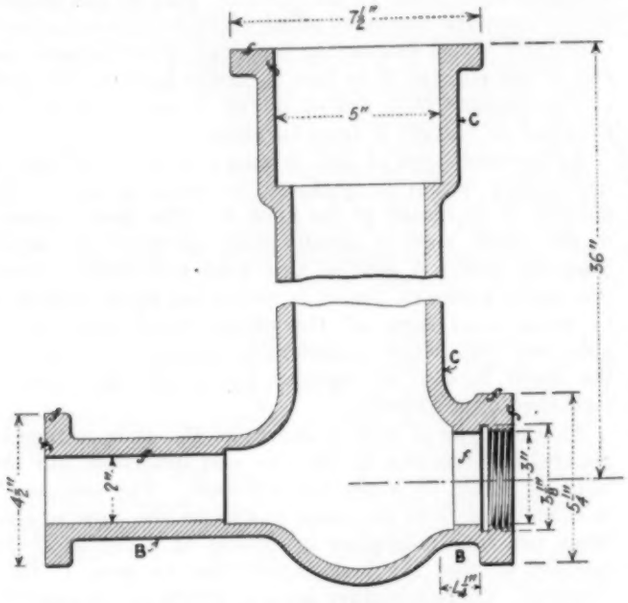


FIG. 1. CASTING TO BE BORED AND THREADED

as illustrated in Fig. 1. The left flange is to be faced and turned on the edge and the center hole bored. The right end is faced on the flange, edge of flange turned, center hole bored, and outer end threaded. The side extension is too long to swing in a small lathe. This job might be handled on the boring mill if it were not for the threading. It is very easily handled in the lathe using the wooden set-up as illustrated in Fig. 2.

In using an ordinary 16- or 18-in. lathe on a casting of this kind I use hard pine or spruce, planed all over 5¾ x 2¾ in. and bolt two pieces across the carriage as shown. If the tool block is in the way it must be removed. I bore out the wood, using a wood-cutting fly tool in a boring bar to fit the circle of casting at points *B* and *B*. Then I clamp the casting down in these recesses which align and center it at once, and hold it very firmly. A slight roughness of the surface will imbed itself in the wood making it hold better than when holding on iron.

Where there are a number of similar pieces to be done, this way is especially advantageous for the reason

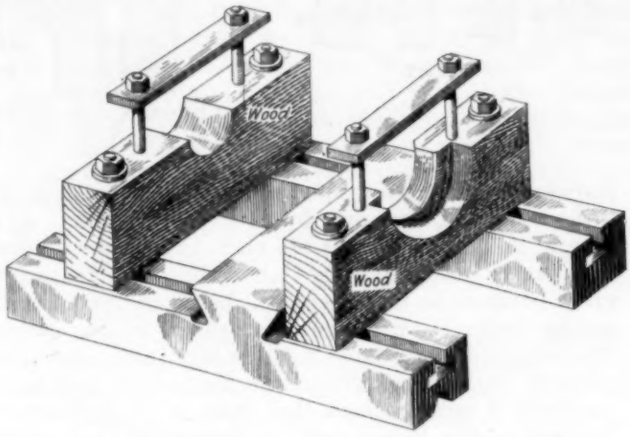


FIG. 2. WOOD BLOCKING FOR HOLDING THE CASTING

that once the wooden foundation is made the change from one piece to another can be made very quickly. Sometimes castings from the same pattern will vary as much as ⅛ in. in diameter, and so I first caliper all the castings and bore the wood to suit the smallest, then a light cut is taken through again when I come to the large ones. I do not make the wood come quite up to the center of the casting, so that the bore in wood is not quite a half circle. For this reason I cannot caliper the bore, but if it is desired to do so, small pieces of wood can be nailed on to increase the height, so as to cut somewhat more than a half circle and allow calipering.

I have no difficulty in boring to the proper sizes by merely setting the fly tool out of the boring bar the proper distance. Have the boring bar run true at the point where the cutter is located and measure its diameter at that point. Then subtract this diameter from the size you propose to bore in the wood and one-half of the remainder is the amount to make the tool project from the bar. For this purpose I have no difficulty in using a common steel scale with sufficient accuracy.

Before bolting the timbers down on the lathe I strike a rough circle with a pencil on their faces and saw and chisel out a rough notch which helps in the boring.

It will be noticed by this method that it is easy to

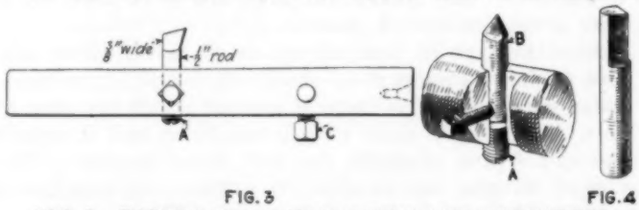


FIG. 3 FIG. 4

FIG. 3. BORING BAR WITH FACING AND THREADING TOOLS. FIG. 4. CUTTER FOR FINISH-FACING

bore the two different diameters to suit the two ends of the casting, and in this case where the right end is only 1 in. wide where it is set into wood, the wood is easily narrowed up to suit with the fly tool, or a round corner can be cut. In fact, the wood can be shaped to the casting whatever it may be.

In facing the left flange it is of course best to have a facing head on the boring bar with a tool block actuated by screw and star wheel, but in the absence of this I use a tool for roughing as shown at the left in Fig. 3. For the work shown this tool would be made of ½-in. drill rod with the top face flattened to about ⅜ in.; then use a ⅜-in., 16-pitch adjusting screw and set out one turn of the screw at each revolution of the bar. This is for roughing, and to keep under the hard scale of the casting I use a small cold chisel ⅛-in. wide, and at each turn I set out the cutter and chip a little niche in the casting to admit it. For finishing I use a cutter as shown in Fig. 4, and then where the flange is too wide to scrape clear across, set out the cutter, and face by suitable stages. In cutting the internal thread use

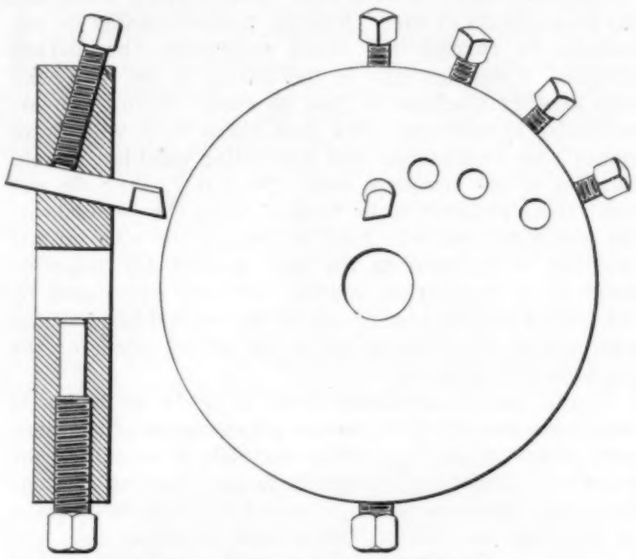


FIG. 5. SHORT BAR FOR FACING

a cutter as shown at *B*, Fig. 3. This cutter is made of ⅜-in. drill rod flattened on top about ¼ in. for a setscrew. Use a ⅜-in. 16-pitch headless adjusting screw and set out about one-quarter turn to each cut. As in facing, the lathe must be stopped to adjust the tool and the tool must be locked fast by the setscrew *C* each time.

To run the carriage back I drop the back center of the bar slightly off the lathe center with the cutter in the up position. This lets the cutter down enough to clear the thread, when the apron nut can be dropped out and carriage run back by hand.

To cut the recess I use a flat-end cutter in the same hole that I use for the threading cutter and use the same setscrew and adjusting screw. I use a stop clamped to the ways of lathe to locate carriage.

To adjust the tool, slack off back center slightly and run carriage ahead so the adjusting screw can be gotten at. Move tool out sufficient for cut and tighten the setscrew. Then run carriage back against stop, tightening back center enough to bring the cutter up in contact with work, and start up the lathe, then, by tightening the back center, the cutter is moved up for its cut. Repeat this process until the recess is sufficiently deep.

To turn the edge of the flange a good way is to use a collar on the boring bar as shown in Fig. 5. In this collar there are four holes for the cutter at different

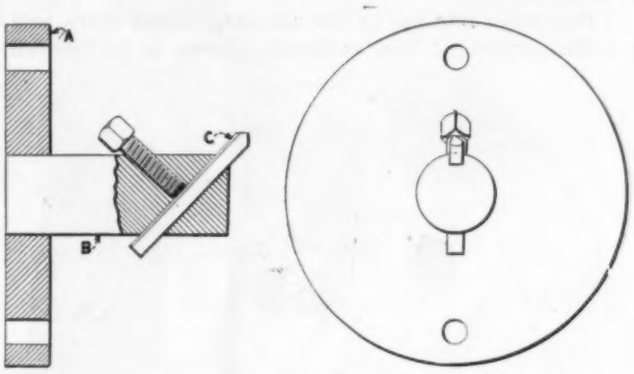


FIG. 6. BORING BAR MOUNTED ON FACEPLATE

distances from the center, and each hole is drilled and reamed at a sufficient angle to allow for some radical adjustment, which is made by adjusting the cutter endwise.

In finishing the long side or projection on the casting, it is fitted into wooden timbers the same as before, resting in bored out recesses in the wood at points *C* and *C*. In this case, as the boring bar cannot pass through the work as it did in the first operation, I use the tool as illustrated in Fig. 6 in which *A* is a cast-iron plate bolted to the small faceplate; *B* is a short boring bar shrunk in the cast plate and carrying the cutter *C*, and has binding and adjusting screws in its end.

Where the hole to be bored is small in diameter, the bar can be simply an arbor fitted to the center hole in the spindle, but for heavy work the center hole is usually too small. In order to accurately square the face of the projection with the first flange, it is only necessary to carefully line the first machined flange with the ways of the lathe by adjusting the timbers on the lathe carriage after the work is in place for the second operation.

In the old shop at Bangor, Maine, we used to bore a lot of cast-iron bevel gears in small sizes, say 18 in. and under. Where there were a number of same kind to do, we used to bolt some hard wood (usually maple) to the faceplate of lathe and bore it out to suit bevel of face of gear and to such depth that inner ends of teeth would bottom. See Fig. 7.

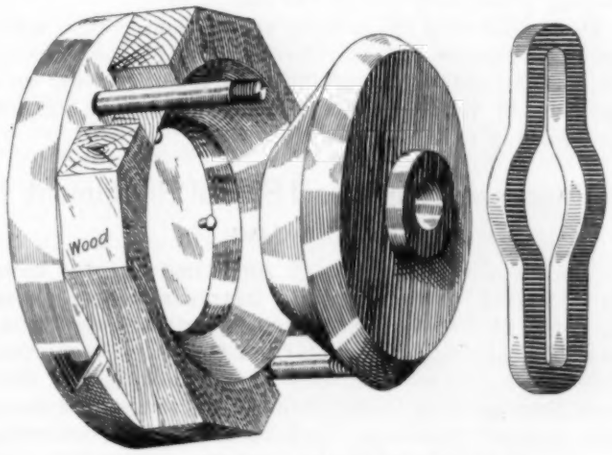


FIG. 7. WOOD CHUCK FOR BEVEL GEAR

When the gear is clamped in, as shown, it holds very firmly, and, of course, always trues itself nicely. When a great many pieces are to be done this is a rapid way of chucking.

I remember one job in the old shop where there was a large number of 2-in. malleable elbows to be rebored

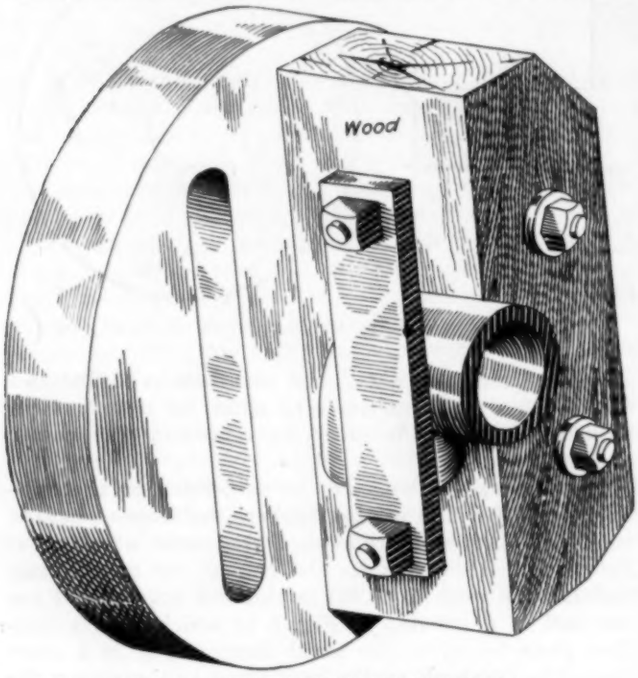


FIG. 8. WOOD CHUCK FOR ELBOW

and threaded for thin tubing. For this work a piece of hard maple was bolted to the faceplate of lathe as shown in Fig. 8, with a recess carefully made to make one-half of the elbow as shown, and bolts and straps were used to hold the piece down. Where it is desired to square the threads accurately it can be done by facing each end of the elbow at the same setting in which the thread is cut. When they are turned about, square the first side with the faceplate by planing off the block or by shimming up where it rests on the face-plate

I have used hard maple parallels on the planer to good advantage to support rough castings. The rough surface of the iron imbeds itself in the wood and has great holding power. Wood is better than iron because of its yielding ability, guarding somewhat against springing the work in clamping if care is used in the placing of supports and in the clamping.

In our old shop the pattern and carpenter shop were very conspicuous and considerably used by the machinist. Today the wood working department is most conspicuous by its absence and sometimes a little lumber for blocking is hard to find.

Purchasing Technical School Equipment

By J. R. Camm

Whenever the question of supplying machine tools for any kind of an educational institution arises, those in authority for the contemplated purchases almost invariably ask for a discount from the prevailing price. Sometimes, however, because of a relatively low first cost, they purchase cheap, inferior and sometimes obsolete types of machines. Such procedure is erroneously thought to be administrative economy. With little reflection upon this practice, any fair-minded citizen with a slight knowledge of the kind, character and essential qualifications of machine tools suited for educational institutions will readily see that it is not only bad practice and poor judgment, but unsound economy.

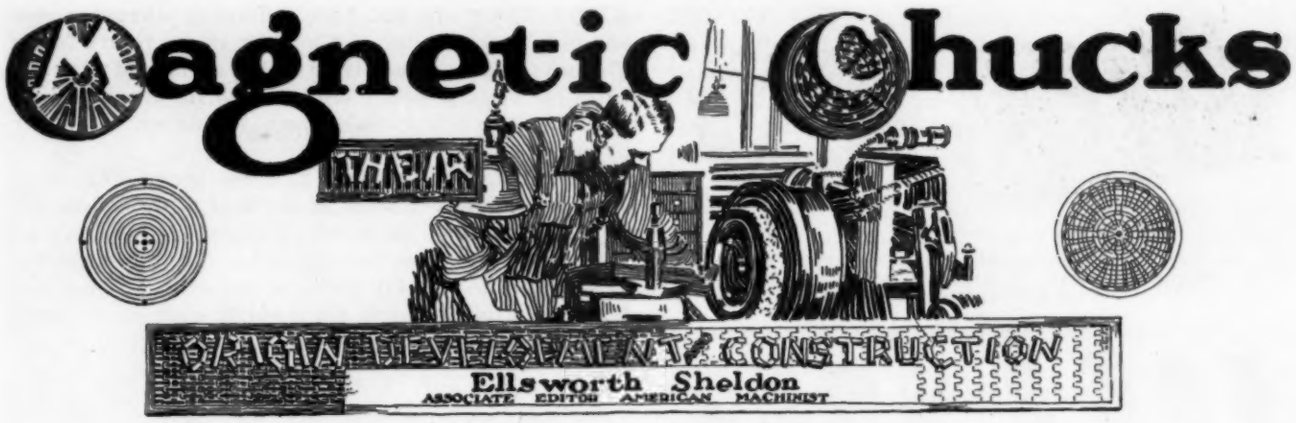
In selecting machines for so important an institution as a vocational, trade, or technical school, it is eminently out of place to make the elements of price, discounts or bids the principal consideration. First-class machine tool manufacturers endeavor to give the highest type of machines for the price. They are not in a position to make discounts, and it is inequitable to ask for discounts. Something cannot be had for nothing, and if a manufacturer is justified in cutting his price for one institution, he should do it for another. This, of course, would be impracticable because it would soon be impossible for such a manufacturer to stay in business, for when goods are sold below the cost of production, or with a margin insufficient to maintain business, the manufacturer must withdraw his machine from the market.

American parents, with their characteristic ideals for the attainments of their children, unquestionably do not hesitate to furnish the finest equipment the market affords. These parents do not listen to the man who says another machine is "just as good," or to the over-enthusiastic salesman who tells them they will "save money" by purchasing this particular machine merely because of its low first cost. Moreover, they do not want their children to be trained upon the products of the manufacturer who fails to change the style of his machine to conform to the best present-day scientific methods of production, neither are they impressed by the money saving arguments of the second-hand dealer who makes no contribution to the advancement of the machine-tool industry.

Young men graduating from a trade or technical school are presumed to possess a knowledge of the best, most practical, and up-to-date methods of machine shop practice. This they obviously cannot possess if their knowledge and practice is acquired by work or training on machines of inferior design and manufacture. The industry of the future will depend upon the type of students that we train in this generation. A great obligation rests upon the faculties of our training schools to supply high-grade mechanics and engineers. In fact, morally, school administrators have no other choice except to provide the best and most scientific models of machines.

It is reasonable to assume that a great injustice is done to any body of students by expecting them to maintain high standards of efficiency on anything except the best equipment that money can buy.

Our Boards of Education and faculties of trade and technical schools are made up of high-minded and broad-gaged citizens, and the writer has no conscious thought of criticism. He merely wishes to call attention to the fact that the best interests of the coming generation of mechanics and leaders in industry, the best consideration for the taxpayer, and the surest possible means of receiving large returns on our educational investments, is to get such equipment as will do the job intended, and do it well. Most people can readily understand that in a training institution, anything less than what is absolutely essential means money thrown away. It is far better to spend no money whatsoever on equipment unless that equipment is of the right kind.



VII. The Simmons Chuck

The Independent-Magnet Chuck Is Composed of "Units" and May Be Made of Any Size Without Altering Detail Construction

THE independent-magnet type is to date the youngest of the magnetic chuck family, and incorporates some of the features of both of its progenitors, the single-magnet and multiple-magnet chucks. Like the former, its entire top surface is magnetic; there being no neutral points except the soft metal dividers. Like the latter, it has several pairs of poles, each with its own pair of energizing coils. Unlike either, its magnets are entirely separate from the chuck body, a certain number of pairs forming "units" of which large or small chucks are built up.

The magnetic chuck made by the Taft-Peirce Manufacturing Co., Woonsocket, R. I., called by them the "unit pole," belongs to the class which we have designated "independent-magnet" for the reason that its

FIG. 112. FACE OF RECTANGULAR CHUCK

groups of magnets are in themselves complete units, each with its own poles and energizing coils, independent of any other group or of the chuck body.

The size of the magnetic group and the number of poles in a group differ somewhat according to the size and weight of the chuck, but a long chuck differs from a short one only in the length of the body and number of units contained therein. Wider chucks are made by placing two rows of units side by side.

In the rotary form of chuck the units necessarily vary in size with the increase in diameter of the chucks, for each unit is cast in the form of a ring of the size required to fill the space inside the chuck.

As the magnets are entirely separate from and independent of the body, the latter may be made of brass, aluminum, or any other suitable material. Cast iron is used in most of the rectangular chucks because it is easy to work, is strong and capable of withstanding rough usage. As the rectangular chuck does not require as much handling as the rotary chuck, the weight is not so important a factor. Rotary chucks that become permanently a part of a grinding machine are also made of cast iron for the same reason. Rotary chucks for use on lathes and for cylindrical and internal grinding are, however, usually made with an aluminum body for the purpose of reducing the weight to be handled by the workman in mounting and demounting them.

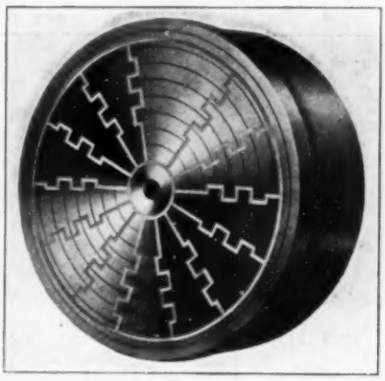


FIG. 113. FACE OF ROTARY CHUCK

The characteristic interlocking polepiece of the Simmons chuck may be clearly seen in Figs. 112 and 113, which show the rectangular and the rotary chucks respectively, and by this feature the chuck may be instantly recognized. There are many chucks whose polepieces interlock but not in just this same pattern.

The inventor of this chuck is Frank L. Simmons of Millbury, Mass., to whom a patent was granted in January, 1918, covering the independent-magnet feature and other constructional details. The patent was immediately assigned to the Taft-Peirce Co., in whose shop the chucks are now built under the supervision of the inventor. Mr. Simmons was not a newcomer to the magnetic chuck game, he having been connected with its manufacture for several years prior to his application for a patent. The original Simmons chuck was built by him at his home in Millbury, the work being done evenings and during such odd moments as could be

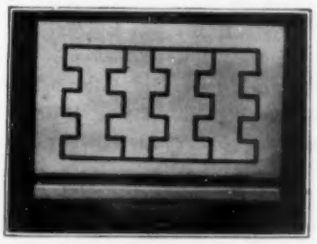
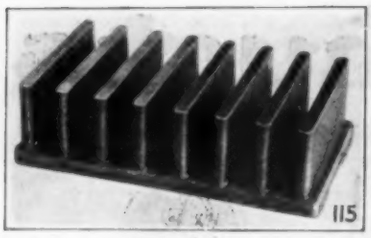


FIG. 114. THE ORIGINAL SIMMONS CHUCK



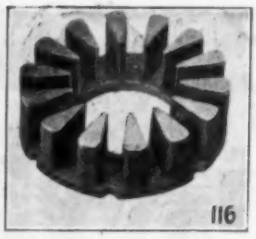


FIG. 115. CORE OF MAGNETIC UNIT FOR RECTANGULAR CHUCK. FIG. 116. CORE OF MAGNETIC UNIT FOR ROTARY CHUCK

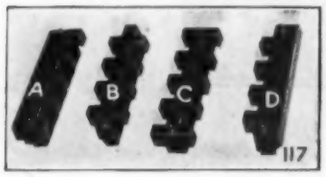


FIG. 117. POLEPIECES FOR RECTANGULAR CHUCK
FIG. 118. POLEPIECES FOR ROTARY CHUCK

spared from the daily routine. When finished it was put into service where its capabilities could be tested to the utmost. A picture of this chuck appears in Fig. 114.

It may be noted that the pattern of the original chuck does not conform exactly to that of the standard chuck shown in Fig. 112. There are projections on the end bars of the frame, and there are three differently shaped polepieces. Though there are in the standard pattern four polepieces of different shape, two of them are end pieces that make the projections from the frame unnecessary.

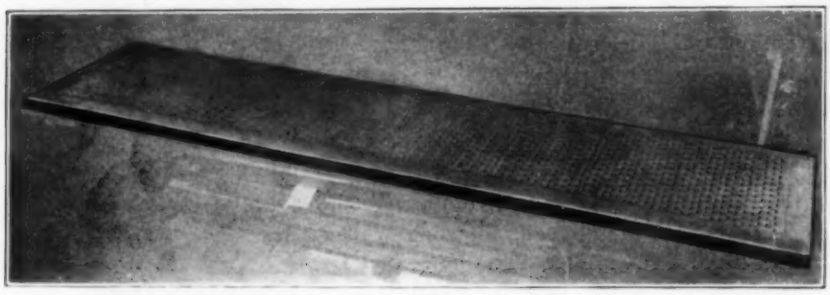


FIG. 119. FACE, OR TOP-PLATE, FOR LARGE RECTANGULAR CHUCK

Magnetic Units of Cast Steel

The magnetic units of the Simmons chuck consist primarily of steel castings which form the back-bar and cores for a definite number of complete magnets. A unit may have any even number of cores, but for convenience in handling the number is limited to eight for the rectangular chucks. Smaller sizes of chucks may have units of six or even of four cores. The units for the rotary chucks are cast in a complete ring and of course vary in size with the diameter of the chuck. Unit cores for rectangular and for rotary chucks are shown in Figs. 115 and 116 respectively.

Very little machine work is required on the core castings. They are ground upon both back and front surfaces and the holes for the holding screws drilled and countersunk and that is all. They are coated with insulating varnish to minimize the possibility of a "ground."

The shape of the polepieces is such as to render these parts readily susceptible to the drop-forging process and they are, therefore, so made from a grade of soft iron selected because of its high magnetic permeability. There are but four differently shaped pieces used in the rectangular, and but two in the rotary forms of chuck; shown respectively in Figs. 117 and 118. In the latter picture each piece is shown in two positions to display the difference between the upper and under surfaces.

Different lengths of each of these pieces containing a greater or fewer number of the lateral projections are made to conform to the width or diameter of the chucks, but other shapes are not required. In the large top plate shown in Fig. 119 there is one each of the pieces *A* and *D* (Fig. 117), and about thirty each of the parts *B* and *C*. The plate in Fig. 119 is 6 ft. long.

Top Plate Is a Frame

The top plate of a Simmons chuck is not a plate at all until the polepieces are set, but a rabbetted frame, rectangular or circular as the case may be. The polepieces are machined on the bottom where they make contact with the cores, and in a later operation the contour is finished by a gang of cutters while held in special fixtures so that each piece is made to fit a standard gage. Two small studs may be seen in Figs. 117 and 118, projecting from the upper surface of the pieces, and the first machining operation is the finishing of these studs by means of a hollow mill so that they may act as locating points in subsequent operations. They are swept off in the final finishing of the top plate after it has become a unit.

The non-magnetic filler used to separate the polepieces, and at the same time hold them in place with respect to the frame and to each other, is babbitt-metal. A frame to be filled is laid face down upon a large cast-iron bench plate where it is located by adjustable gage pieces held by clamps. The polepieces are now set in their respective places; the small studs entering holes in the plate to locate and hold in place each piece during the pouring and staking operation. Because of the milling to exact size and shape of each piece and the exact location made possible by the studs—by which the pieces have already been located in the milling fixture—there is no uncertainty about the thickness of the non-magnetic dividers; the distance between pieces has been carefully calculated and can be positively maintained.

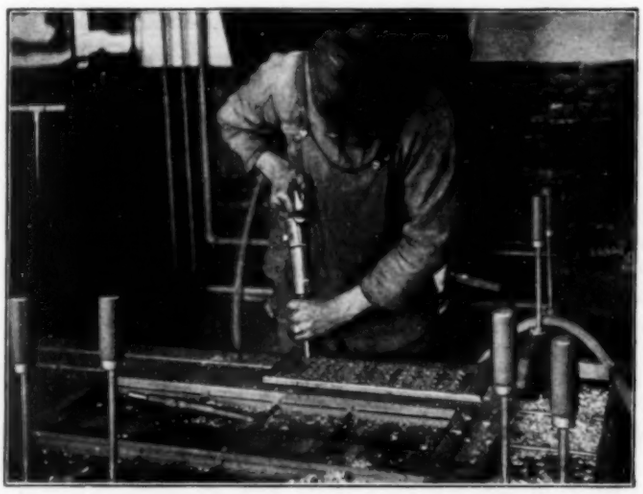


FIG. 120. STAKING IN THE NON-MAGNETIC FILLER

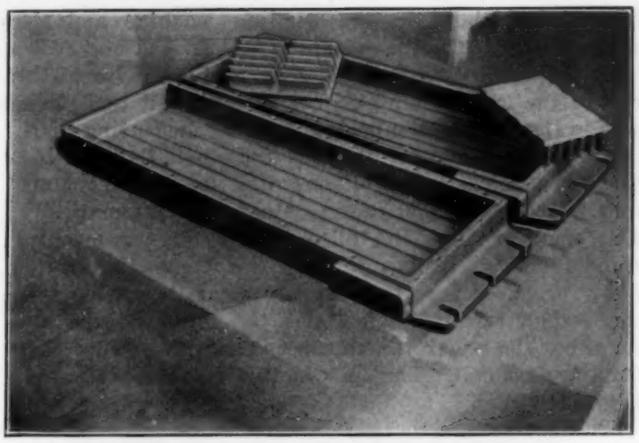


FIG. 121. CAST-IRON SHELLS FOR LARGE RECTANGULAR CHUCKS

The shape of the under surface is such that there is a broad channel between all the polepieces, the depth of which is about one-quarter of the finished thickness of the top plate. Below this channel and extending down to the iron of the bench plate is the narrow sinuous crevice that separates the polepieces from each other and the equally narrow but straight channel that separates them all from the frame. The broad, shallow channels act as runners to lead the molten metal to all open spaces within the frame and thus insure complete filling of all interstices with little likelihood of cold-shuts, imperfect casting, or bubbles. The staking operation, shown in Fig. 120, follows the pouring. The bench plate is large enough so that the pouring and staking operations may be continuous, making it unnecessary—as it would be undesirable—to lift a filled top plate and have to put it back again for staking. The staking is done by means of a pneumatic hammer. On the bench plate shown in Fig. 120 will be seen several of the frames, in which the polepieces have not yet been set, with round-sectioned rods running transversely across them. These rods are of hard brass or bronze, and were laid on the molds in the foundry and the frames cast around them. They thus become permanently a part of the frame; acting as tie-rods to prevent the frame from bulging or spreading in the center from any cause, and being of non-magnetic metal, they do not interfere with the magnetic currents.

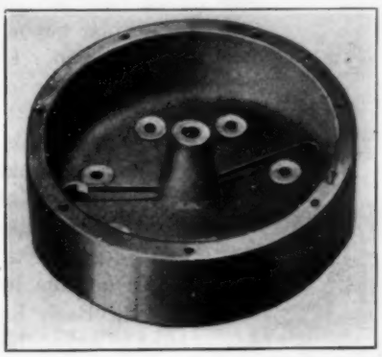


FIG. 122. SHELL OF ROTARY CHUCK

After the soft metal filler has been staked in, the top-plates are rough-milled over the upper surface and are finished by milling and grinding the under surface, which must make a watertight joint with the edges of the shell and at the same time make firm contact with the finished upper ends of the cores.

Rectangular shells or chuck bodies may be seen in Fig. 121. These shells are usually made of cast iron for the reason that this metal combines ease of working with mechanical strength and comparatively low cost, while lightness of weight in this form of chuck is not a serious consideration. They are not, however, allowed to come in contact with the magnetic parts and do not therefore, carry magnetic currents to any extent.

Machine Work Reduced to a Minimum

The rectangular chuck bodies are planed upon the under surface, which is ribbed; milled on the upper surface of the ribs that may be seen in Fig. 121 at the bottom of each shell; milled and ground upon the upper edge of the shell; and milled or planed upon the vertical face of the rectangular boss to be seen near one end. This boss is for the terminal box attachment through which the magnet coils connect to the current supply.

Top plates are held on by fillister-head screws passing up through the sides of the shell, entering tapped blind holes on the under side of the top-plate; the holes for the screws by which the terminal box is attached do not go through the iron; the magnet cores are attached to the bottom of the shell from the inside by brass screws tapped into blind holes. Thus it may be seen there is no opening to the interior of the closed chuck except the one by which the leading-in wires enter, and this is finally covered by the terminal box; the joint between box and shell being sealed by a rubber gasket.

In Fig. 121 may also be seen two of the core units which in this particular chuck (a special large size) are cast in sections of three pairs each; each of the cores being interrupted midway of its length to allow the use of two shorter coils on each core instead of one long one. The units are attached by brass fillister-head screws to the ribs at the bottom of the shell, but are separated from these ribs by strips of bakelite.

In Fig. 122 may be seen the body or shell of a rotary chuck in which the magnetic unit—in this case a ring—rests upon round washers of fiber, or bakelite, being attached by brass screws to the circular bosses shown

FIG. 123. COIL WINDING MACHINE

FIG. 124. A BATCH OF COILS READY FOR IMPREGNATING

at the bottom of the shell. If the shell is made of non-magnetic material, as many of the rotary chucks are, the bakelite or fiber insulators are unnecessary.

In preparing the magnet coils for the Simmons chuck, no previously treated fabrics are used; the insulation of the magnet wire is cotton, and ordinary cotton tape is

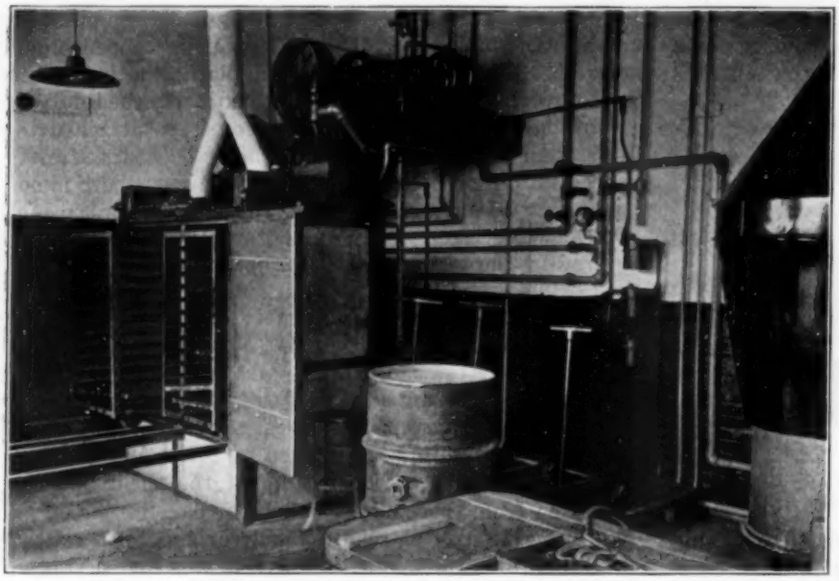


FIG. 125. THE IMPREGNATING AND BAKING MACHINERY

used for binding the coil. This apparent disregard of precautionary measures against grounding is, however, not without reason, as the reader will observe in following out the after-treatment of the coil.

The winding of the coils, shown in Fig. 123, is a job for two girls, one of whom operates the winding machine while the other prepares the bobbins on the small hand-operated device seen at the left in the picture.

The bobbins are of steel or aluminum, according to their size, separable along a diagonal line leading across the body so that a slight pull upon the respective heads of a bobbin will release it from a tightly wound coil and allow the latter to be removed without difficulty.

To prepare a bobbin for winding the operator sets the two halves together, dowel pins locating the parts with respect to each other and a latch upon one of the parts holding them together. Slipping the complete bobbin onto the spindle of the device she lays several strips of cotton tape lengthwise upon it and binds them to the body of the bobbin with a strip of fabric the width of which is equal to the length of the coil. This serves to hold the binders in place and also to hold the magnet wires after the bobbin is removed. The ends of the binding strips are caught under clips to keep them from flying about in the winding machine and the bobbin is ready for the machine.

The machine operator solders a terminal wire to the end of the magnet wire on her reel, slips it through a hole in the head of the bobbin, sets the measuring dials, to the required number of turns and starts the machine. Each revolution counts off one digit on the dials until zero is reached, when the machine stops automatically. The operator slips the filled bobbin off the machine spindle and exchanges it with her companion for a newly prepared one; the other operator then solders on the second terminal wire, ties the binding tape and takes out the bobbin which she proceeds, to set up ready for the next coil. The coils at this stage appear as at Fig. 124.

The reason for the porous cotton insulation will be seen when the impregnating process is considered. The machinery for this purpose is partly shown in Fig. 125, and is somewhat elaborate.

The varnish used for impregnating the coil is quite hard when baked, is impervious to moisture and of a chemically inert nature. The impregnating tanks cannot be seen in the picture for the reason that they are located in a fireproof vault just beyond the brick wall back of the oven. The machinery on the shelf over the oven is for the purpose of exhausting the air from the tanks.

The varnish is melted by steam coils within the tanks and held almost at the boiling point. A basket arrangement in the upper part of each tank can be moved up and down by means of an outside lever after the tank is closed. Each batch of coils is thoroughly baked before impregnating to expel any trace of moisture, and while hot, is immediately transferred from oven to impregnating tank, the cover of the latter closed, and the air exhausted. After remaining in vacuum for several minutes the basket of coils is lowered into the hot varnish and air re-admitted to the tank. Thus it will be seen that the fibrous material with which the wires are primarily insulated is not depended upon for the real insulation; it merely serves to hold all metal parts out of contact with each other during the preliminary construction. Its porous nature permits it readily to give up its moisture while in the oven, to release whatever air may be in the coil while it is in the vacuum chamber, and as readily to absorb the molten varnish which will, when the air pressure is restored, penetrate to and fill all the minute interstices.

After removing the coils from the varnish and drain-

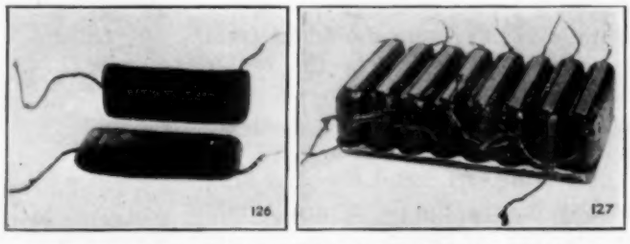


FIG. 126. COILS READY TO BE PLACED ON A CORE
FIG. 127. A MAGNETIC UNIT

ing them they are returned to the oven and subjected to a baking heat for several hours, after which they are shellacked, wound with prepared tape and again shellacked.

Connecting the Coils

A pair of coils ready to take their place in a chuck are shown in Fig. 126. It will be noted that one terminal wire in each coil leads from the edge at one end while the other terminal is taken from about the center, widthwise, of the coil at the other end. This is standard practice in the winding room, and this unvarying posi-

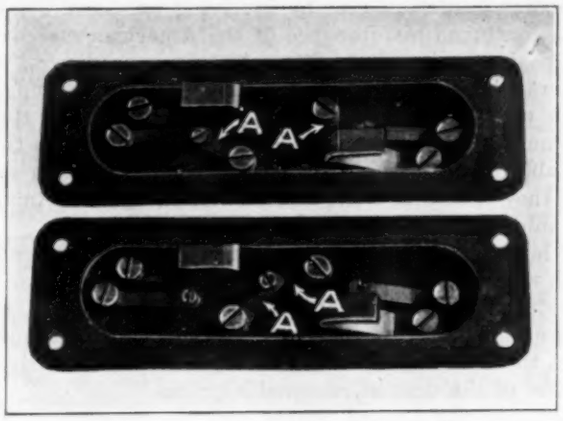


FIG. 128. THE TERMINAL BOX

tion of the terminal makes a mistake in connecting the coils very unlikely. A magnetic unit with its coils ready to be connected is shown in Fig. 127.

The Simmons chuck, like nearly all others, is designed to be used in connection with either 110 or 220-volt current. To facilitate changing the connections that adapt it to one or other of these currents the terminal box, the inner part of which is shown in Fig. 128, is made in two parts. The two views in this picture are of the same piece; one connected for 110 and the other for 220 volts. The change is effected by loosening the binding screws that hold the two parts of the swinging connector bar *A A* to the outer terminals, bringing them together and joining them at the center. The only tool necessary to do the work is a screwdriver.

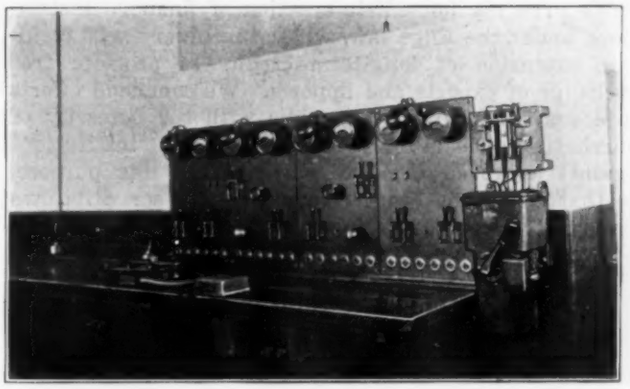


FIG. 129. THE TESTING PANEL

All chucks are tested under service conditions before shipping them out of the factory. They are also given a "ground" test with a high-voltage current. The testing panel is shown in Fig. 129, where there is provision for the attachment of 24 chucks simultaneously. Back of the board is a motor generator set adapted to deliver to the terminals either 110- or 220-volt current as may be desired.

Final Declaration of the Foreign Trade Convention

Immediate Creation of Financial Institutions Under Edge Law Urged — Costs of Railroad Transportation Must Be Reduced — Foreign Service of U. S. Should Be Reorganized

THE eighth National Foreign Trade Convention, composed of upward of 1,500 delegates, representing every part of the United States and every factor of our international commerce, met in Cleveland from May 4 to 7, 1921, to study the problems confronting our foreign trade as a result of present world-wide conditions. As a brief statement of the conclusions reached from consideration of the addresses and discussions at its various sessions, it submits its final declaration and commends these opinions and recommendations to the thoughtful attention of the Government and the people of the country.

The world is suffering today from unbalanced exchanges. Notwithstanding the position of the United States as a creditor nation, the present unstable financial condition of a large part of the world, especially of Europe, is the fundamental cause for our own business depression. A return to normal conditions in our own country depends in large part upon an improvement of our foreign trade. The present retrogression is clearly evidenced by the maximum of the country's export trade $928,000,000 in June, 1920, decreasing in October to $751,000,000 and in March, 1921, to $384,000,000.

Foreign nations whose imports exceed their exports have been compelled to curtail purchases because of inability to pay by exports. The result of this would be eventual restoration of more normal exchange, but the requirements of international commerce and domestic prosperity in each country demand immediate relief from present stagnation.

The United States must continue to increase its imports of raw material and merchandise not detrimental to existing industry in order to receive pay for the exports necessary to stable employment of labor in agriculture and industry; and to permit of the liquidation of the obligations of the debtor nations. Continued liquidation in gold of foreign obligations to us will tend to renew inflation and arrest the beneficial readjustment of values on the basis required by present conditions throughout the world.

Long-Term Credits

It is generally agreed that the solution depends upon our ability to create adequate facilities for the purpose of drawing upon surplus American investment funds in order that the long-term credits so badly needed by the disorganized countries of Eurpose may be furnished. Most of the countries of Europe are unable to pay us now and for some time to come in gold or merchandise, and unless they are enabled to obtain credits to purchase the raw materials which they need, their business and ours will continue to stagnate.

We urge the immediate creation of financial institutions under the Edge law, whose machinery will facilitate extension of long-term credits to promote free exchange of exports and imports. We commend efforts to acquaint our investing public with the necessity of purchasing debentures issued by such institutions against approved foreign securities for this purpose, so that eventually every community will serve its own vital interest in furthering our foreign commerce as a necessary component of domestic prosperity.

Financial Condition Strong

The reduction of loans and accumulation of banking reserves now permit, and the lower prices of many commodities justify, the extension of credits sufficient to accelerate recovery in certain lines. This should gradually thaw frozen credits and end stagnation. It will further provide increasing export and import cargoes for our now partially idle merchant marine and contribute to restoration of economic equilibrium in countries suffering from war debts and inflated currencies and to a proper distribution of commerce in neutral markets.

The increased confidence prevailing in the American business world denotes the disappearance of danger of financial panic. As liquidations progress and reconstruction in Europe proceeds, normal conditions will be restored. Nevertheless, after so great a disturbance in business and financial conditions, it is prudent to recognize that equilibrium will be restored and commerce resumed only by gradual processes. Months may elapse before necessary liquidation will have been accomplished. It will continue to be the part of prudent commercial and financial interests to refrain from hasty and ill-advised expansion, tending through renewed inflation to nullify quickly the present fruitful efforts of conservative business men to lead the country back into paths of safety and sanity.

It is manifest that while many products of our soil have been reduced in value to pre-war levels, a number of manufactured products remain too high in cost of production to compete in neutral markets with foreign goods. It is essential that the substantial reduction in cost of living, which has already occurred in food products and other basic commodities, shall be followed by economies in cost of production until a stable balance of values of all commodities and productive effort is established. No readjustment, however, can be complete without reduction of costs of railroad transportation both for domestic and export shipment. Continuance of our present cost of finished merchandise would maintain unreasonable expense of living and put our products in a non-competitive position in markets of depleted purchasing power.

American Maritime Policy

Congress has declared in favor of private ownership of our merchant marine as soon as practicable, but under present conditions it is impracticable to dispose of any considerable proportion of our merchant marine to private owners at fair prices.

So much of the fleet as can not be chartered on a bare boat basis or time charter to private operators should be laid up pending the revival of world commerce, meanwhile the fleet will serve our national security as a naval auxiliary, in case of necessity.

The plan should be abandoned of allocating ships to load at ports and for trade routes irrespective of the tonnage of cargo offering or of the losses to the Government attendant on this policy.

While it is obvious that the ultimate sale price will be measured by the world market for similar ships, such parity of price and successful operation can be obtained only if the operating costs are approximately equal to those of our foreign competitors.

Present shipping laws requiring larger crews subject American vessels to a disadvantage estimated at 5 per cent on the capital investment, while the compulsory advance of half wages in any foreign port of call adds a further burden of cost by involving excessive delays.

As continued maintenance of the American merchant marine is of vital interest to American producers, exporters and importers, they should require the employment of American vessels in the carrying of their shipment of exports and imports to such extent as they are able to exercise preference or control and in any case they should prevent discrimination against American ships in such transportation.

It is believed that the adoption of these recommendations will save the Government its present large loss in carrying on the existing plan of operation and will insure ultimately the retirement of the Government from the shipping business through the sale to private owners of the fleet at reasonable prices.

Between the United States and its possessions and foreign ports, rapid, regular combined passenger and freight service should be maintained for the prompt and regular carriage of the mails, express freight and merchandise.

The State and Federal governments are urged to remove those disabilities caused by non-uniformity of state laws and excessive taxation which place American insurance at a disadvantage with the foreign insurance market in which they must compete. We urge the enactment of the marine insurance measure now pending in Congress, a model upon which uniform state legislation may be based.

Excessive governmental expenditure in all countries imposes upon the commerce of the world a burden, the further increase of which can end only in disaster. Provision of facilities for commerce is futile if every business activity continues to be oppressed by a multiplication of taxes. For the recovery of normal prosperity the utmost economy in governmental expenditures should be accompanied by unremitting frugality in private business.

Contractual Obligations

Throughout the world the stress of readjustment has been attended by deplorable violations of the sanctity of contracts, emphasizing the absence of adequate international machinery for the enforcement of awards of commercial arbitration. This deficiency should be promptly remedied. In many instances all parties affected by breaches of contracts sincerely believe themselves in the right, as numerous commodities in foreign trade are not standardized. Standardization of the grain, cotton, iron ore and other stable trades has protected them from the defaults so numerous with merchandise to which standardization should, so far as practicable, be applied. Business interests should cooperate with the United States Government to this end.

Through the initiative of the National Foreign Trade Council standard definitions of shipping terms (F.O.B., C.I.F., etc.) in foreign trade have been generally adopted

in the United States. The concurrence therein of commercial organizations abroad should be sought by the council. Revision and uniformity of ocean bills of lading is greatly to be desired now that the hazards of war are removed.

Export Trade and Tariff

We commend the efforts of the American Bankers' Association and other organizations to adopt uniform standards of Letters of Credit.

American export business has been injured in the past by lack of persistent effort to hold markets already gained. American producers are urged not to abandon or lose interest in their foreign trade because it shows no profit for the moment and to remember that in many cases it will cost much more to regain in the future a business lost now through lack of courage and foresight.

The vast market which the United States offers to other nations on a basis of equality, and the supplies of American raw material exported without taxation or discrimination, entitle the American export and import trade to equality of treatment in all foreign markets.

To insure such equality of treatment, the American tariff, whatever its underlying principle, should provide for additional duties on imports from nations discriminating, by tariffs or administrative practices, against the trade of the United States.

Foreign Service

The Foreign Service of the United States should be reorganized and established under a unified supervision which will promote its efficiency, both in diplomatic representation and in the collection and dissemination of commercial information. This reorganization should provide for a permanent career through the establishment of a national training academy for the Foreign Service, which will attract competent and ambitious young men into a life work of constructive effort in their country's service.

Scientific educational training is as essential for our business agents as for our official representatives. It should equip them with accurate and practical knowledge of foreign markets and languages, as well as of the economic social and political conditions prevailing in other lands. The exchange of scholarships, already established with several countries, is a most helpful means to this end, and should be widely encouraged.

Legislative Assistance

The convention urges upon Congress the vital importance of prompt action upon measures affecting our foreign trade now pending before it. Chief among those calling for immediate enactment are the increases of appropriations that will provide for much needed expansion and improvement in the Bureau of Foreign and Domestic Commerce in the Bureau of Standards in the Department of Commerce.

We urge the earliest possible enactment of the China Trade Act, which will permit the formation of American companies to trade in China on a plane of tax equality with their competitors of other nationalities.

We submit that the policy of taxing Americans abroad upon income derived from within the country of residence is fundamentally uneconomic; is really restrictive rather than productive of revenue, and is a handicap upon the promotion of American commerce dangerous to the success of American enterprise abroad and bound to react disadvantageously upon industry at home. The United States is the only great commercial nation which pursues this policy, and we urge Congress to abandon it in the forthcoming revision of the revenue laws.

The steady maintenance of a prosperous foreign trade is as vital to the successful operation of government as to the welfare and contentment of all our people, and we submit that the time has come when the two houses of Congress may well consider the establishment of separate standing committees on foreign commerce as a means of insuring more prompt and effective handling of measures affecting foreign trade.

We commend the improvement of foreign postal communications and the extension of international parcel post service recently accomplished and urge upon Congress the revision of the revenue law necessary to permit the negotiation of a parcel post convention with Cuba, so that our manufacturers and exporters may be enabled to enjoy the same means of access to that market now available to their European competitors.

Waterways and Telegraph

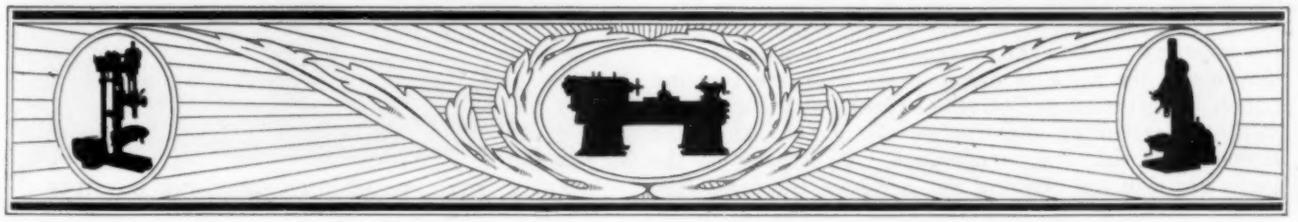
It is essential to the best development of the trade and commerce, both domestic and foreign, of the United States, and for defensive purposes in time of need that our national waterways should be developed adequately and fully utilized.

The popularization of overseas trade by those news and trade publications and press associations which have given valuable space and journalistic skill to the gathering and dissemination of accurate foreign news is recognized and appreciated. In certain sections of the country the supply of foreign news is inadequate for the needs of their industries, and this condition retards public understanding of foreign trade policy, and of the true relation of foreign trade to the welfare and prosperity of our people.

Expansion of the systems of international telegraphic communication, under American control and operation is essential to proper development of our foreign trade.

In the international conventions necessary to establish equal opportunity of all nations in the development of their communications we urge the importance of separate treatment of the two chief methods of communication on radio and cable.

This convention, representing every section of the United States, and without regard to politics, approves the policy of the State Department regarding mandates as expressed in its recent note to the principal powers, and pledges thereto its full support.



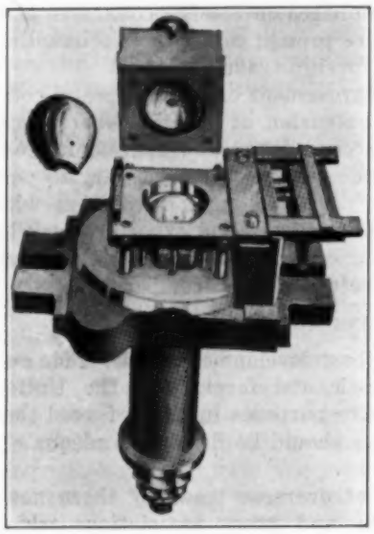
Ideas From Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Blanking, Forming, Trimming and Piercing in One Operation

By Leonard H. Anderson

The press-tools shown in the accompanying cut were designed to blank, form, trim, and pierce the shell shown at the left of the tools; all in one stroke of the press. The shell is a deflector, used in connection with small electric lamps. The tools were used in a single-acting, inclinable power press of 3½-in. stroke, the stock being fed by hand through the guide attached to the right-hand side of the lower tools. The material used was soft brass of 0.017-in. gage and 4½ in. wide. The upper surface of the lower tool is a pressure pad, backed up by a stiff rubber bumper in the tube below the die and supported in the usual manner upon four pillars that pass through the die-bed and rest upon a pressure ring on top of the bumper. The pressure pad stands normally at a level that just clears the forming punch; which in this case is a part of the lower tool. The piercing punch is in the upper tool and projects just far enough from the surface of the drawing die to allow it to pierce the shell at the instant the drawing is completed.



TOOLS FOR BLANKING, FORMING, TRIMMING AND PIERCING A SHELL IN A SINGLE ACTION PRESS

The trimming punch is at the bottom with the drawing punch mounted on top of it, and is an exact fit for the trimming die; which is the lowest part of the upper tool. The forming die, which is also at the top, does not conform exactly to the drawing punch, but is enough deeper than necessary to complete the form to allow for the slight additional movement necessary to trim and pierce the shell.

In action, the stock is cut off by the right-hand edge of the tool as it passes the stationary shear blade, leaving a square blank that is immediately gripped between the upper punch and the pressure pad. Continuing the movement, the stock is drawn down over the forming punch, the pressure pad serving to keep out the wrinkles, until the trimming die reaches the punch; at which moment the drawing is complete. By reason of the extra depth of the drawing die, however, the press gate is able to continue its movement by an amount sufficient to trim the flange and pierce the shell.

The completed shell is carried up by the returning tools and is stripped by a knockout rod at the top of the stroke, from whence it falls clear of the tools by reason of the inclined position of the press. The scrap is carried up by the pressure pad and is blown clear by a jet of compressed air. The scrap from the piercing punch passes out through the hollow rod in the center of the rubber bumper.

The tools were designed and built by the Phœnix Tool Works, 2 Remer St., Bridgeport, Conn.

Safety Features for Grinding Machines

By J. H. Vincent

In the Decatur shops of the Wabash Railway all belts that are near enough the floor to endanger the workmen are encased in sheet metal guards similar to

FIG. 1. BELT GUARD ON A GRINDING MACHINE

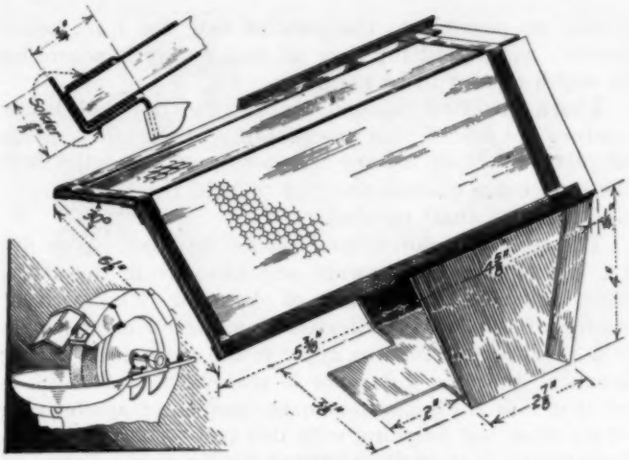


FIG. 2. TYPE OF SPARK GUARD INSTALLED OVER GRINDING WHEELS

that shown in Fig. 1. The guards are so attached that they may be readily removed when it is necessary to repair the belts. They are also used for the prominent display of safety warnings, as witness the one shown.

The guards mentioned on the warning are now being installed on all grinding wheels in the shop. The details are shown in Fig. 2. The guard is readily adjusted so that all sparks and grit particles are prevented from flying up into the workman's face. Wire glass is used in the frame of the guard, as shown.

Countersinking Attachment for the Drilling Machine

BY E. A. DIXIE

The illustrations show an exceptionally handy little attachment for use where there is a lot of countersinking or counterboring to be done, especially on rough and irregular castings.

The body *A* is of machine steel although cast iron would be quite satisfactory. It is bored to be an easy sliding fit on the drilling machine quill *B*. At the back it is slotted out to clear the feed rack on the quill and a crosshole is drilled for the clamping bolt which is tightened by the lever nut *C*.

A vertical hole accommodates the spring plunger *D*, the bottom end of which is simply a round button head, the other end being threaded for the two check nuts *E* that serve to adjust its movement in the body *A*.

When the clamping lever *C* is loose the quill can be moved up or down without compressing the spring plunger *D*. But when the clamping lever *C* is tightened the attachment becomes virtually a part of the quill and the quill can only be moved downward till the top of the button head on *D* is brought into contact with the face of the body of the attachment by the quill bracket *F*.

A half a turn of the clamping lever *C* serves to release the attachment and for this reason it is very handy for countersinking castings or work of irregular height. The attachment is first set by bringing the point of the countersink down on top of the work near the hole that it is desired to countersink. The stop *D* is then set by adjusting the nuts until the required depth of countersink is obtained, at which time the spring will be compressed as shown in Fig. 2. Obviously a setting once obtained in this way will be correct for any part of the work no matter what its height.

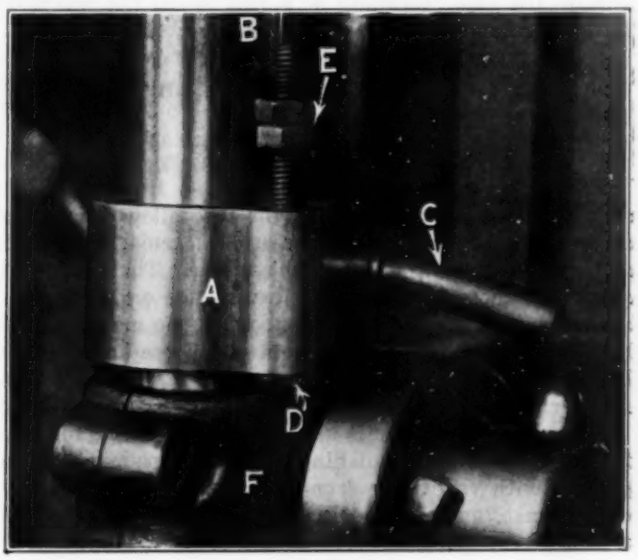


FIG. 2. THE ATTACHMENT WITH STOP COMPRESSED

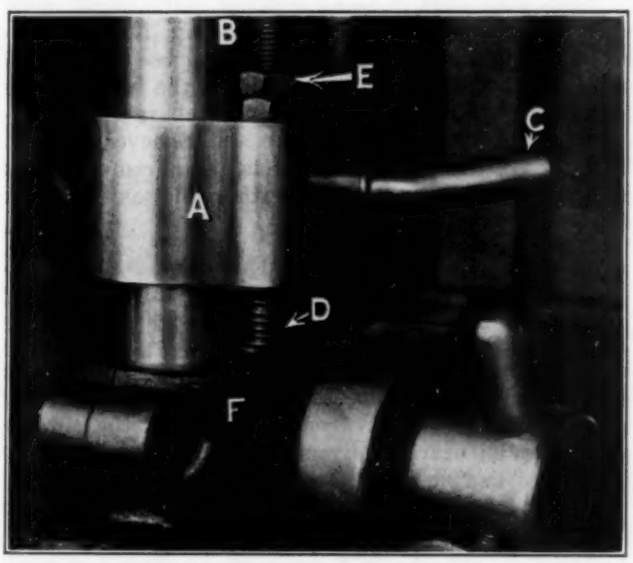


FIG. 1. THE ATTACHMENT WITH STOP EXTENDED

The different holes in the work are now moved under the countersink and all the operator has to do is to see that the point of the countersink touches the surface of the work at the edge of the hole to be countersunk *before* he clamps the attachment tight to the quill.

In operation the attachment is much more rapid than it might seem to be from the description.

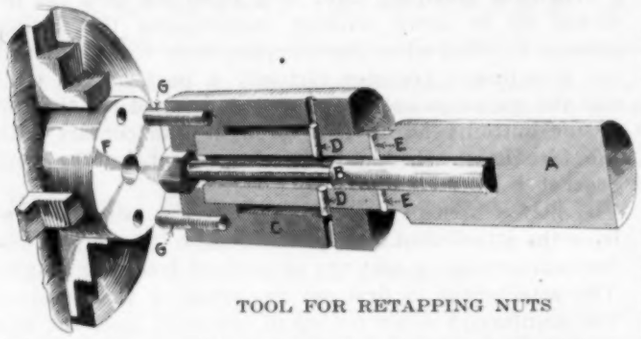
Tool for Retapping Nuts

BY HARRY MOORE

A large quantity of brass nuts was required to be retapped and the fixture shown herewith was made to do the job.

The nuts were retapped in a hand-screw machine and the object of the fixture was to enable the boy to complete the operation without stopping the machine. The tap holder *A* was turned to fit the turret hole and drilled for the tap *B*. Sleeve *C* is a running fit on the turned down portion of *A*, and is recessed to form a lighter bearing and also to clear the pins *DD*, driven into *A*, which prevent the two parts from coming apart. An opening in the front of the sleeve *C* is filed

hexagon to fit the nut. Two pins *EE* driven into *A* engage two slots in the shank of the tap, allowing the latter to slide back and forth but preventing it



TOOL FOR RETAPPING NUTS

from rotating. Piece *F* is gripped in the chuck and has a clearance hole for the tap and two holes in line with pins *GG*. In operation the nut is placed in the sleeve *C*, the holder advanced until pons *GG* enter the holes in *F*. The sleeve revolves, and further advancement of the holder presses the nut against face of *F* and on the tap. Running at a fast speed the machine is reversed immediately the nut reaches the face of *F*.

Know Why You Do Things

By M. H. Ayrbn

With reference to L. S. Watson's query on page 883, Vol. 53, of the *American Machinist* as to why a tool should be set below center, might I be allowed to offer an explanation and also make a few remarks on the setting of tools in relation to the center. There are two shapes of tools that practical experience on a medium and a heavy class of lathe work compel the machinist, if he is observant, to set below center. These are the set-back stiff scraper, Fig. 1, and the swan-neck spring scraper, Fig. 2.

The set-back scraper is used on steel shafting for dry finishing before wet finishing. This tool requires to be ground with very little front clearance but with plenty of top rake, and with a little honing after grinding it will cut very cleanly. A feed of $\frac{1}{4}$ to $\frac{3}{8}$ in. can be used according to diameter and rigidity of work. This tool, if correctly hardened and ground, will remove 0.025 in. from the diameter of a steel shaft 12 in. in diameter, using a $\frac{3}{8}$-in. feed and will carry its cutting edge during a cut 15 to 20 ft. in length. To use this tool, grip as

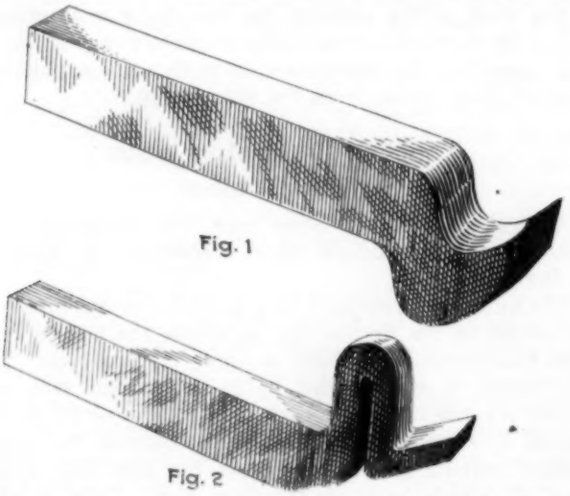


FIG. 1. SET-BACK STIFF SCRAPER. FIG. 2. SWAN-NECK SPRING SCRAPER

closely as possible to the neck of tool, set $\frac{1}{4}$ in. below center; adjust cutting face of tool on work according to width of feed to be used.

There are two reasons for setting the tool below center: the first is that the pressure of the cut is in an angular direction toward the center of the lathe bed. This pressure enables the tool to hold the cut securely and turn the shaft parallel.

The second reason is that should this tool dip or dig in, it will spring downward and away from the shaft, thus reducing the amount of damage. The path of spring of the tool is indicated by an arrow as shown in Fig 3. The same reasons apply to the swan-neck, spring scraper—the only difference is that 0.006 to 0.01 in. is all that it is advisable to remove from the diameter of a shaft when wet finishing with this tool. The lathe slide-rest must be carefully adjusted before using either of these tools.

In practice on heavy lathe work roughing tools are set at the height of lathe centers. Roughing tools have an increased front rake and decreased top rake which throw the weight of the cut on lathe carriage and bed.

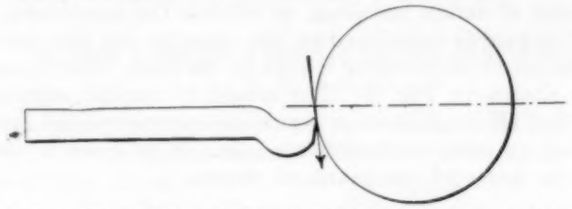


FIG. 3. DIRECTION OF PRESSURE WITH SET-BACK STIFF SCRAPER SET BELOW CENTER

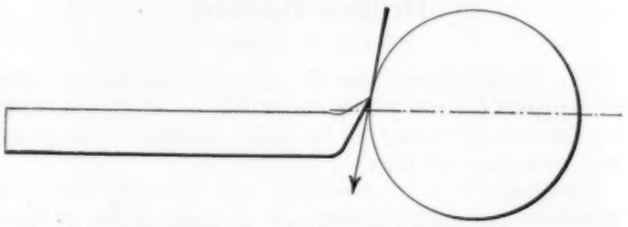


FIG. 4. DIRECTION OF PRESSURE WITH ROUGHING TOOL SET ABOVE CENTER

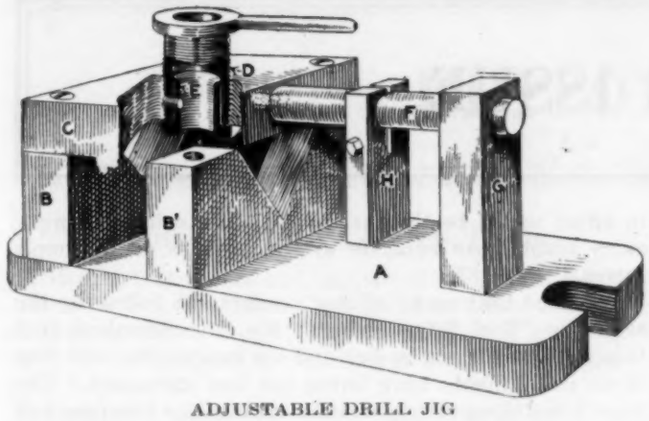
V-threading tools should also be set at the height of the lathe centers, for if this rule is ignored the correct depth and form of the thread will not be cut. When medium or light lathe work is being roughed, particularly work that requires a steadyrest for finishing, it is best to set the roughing tool above center and use a fine feed and a quick speed. The front rake of the tool must be increased. The raising of the tool above center decreases the spring of the work and removes chatter. The force of the cut in this case is away from the work and against the screw of the lathe slide, as shown in Fig. 4.

Jig for Drilling Nipples

By K. Saldiz

A quantity of nipples from $\frac{3}{8}$ to 1 in. in diameter, inclusive, had to be drilled in one place radially. The size of the drills differed for each size of pipe; also the holes were spaced from the end of the nipples differently on nearly every order, so a jig was built as illustrated and described here.

A baseplate *A* was provided with two slots by which it was clamped to the table of the drill press, and two V-blocks *B* and *B'* were fastened to it, big enough to accommodate the largest nipple. On the ends of



ADJUSTABLE DRILL JIG

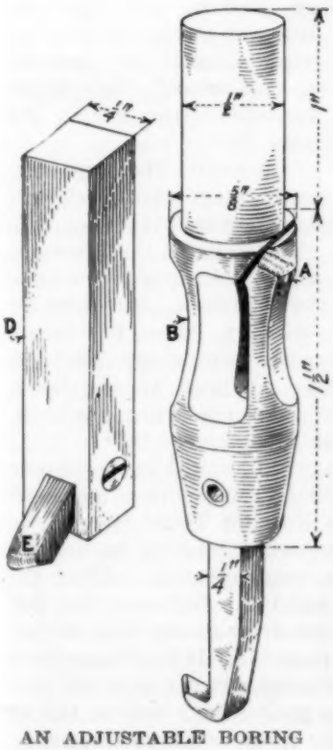
the two V-blocks a plate *C* was fastened, with a threaded hole in the center, to take the threaded bushing *D*. This bushing had a handle by which it could be screwed down tight on the nipple. The hole in the bushing was big enough to take the largest drill bushing *E*, held in by a small setscrew. The bushings for the different sizes of drills were all of the same outside diameter. A rod *F* was screwed in the top plate, the other end resting in the pillar *G*, that was set in the baseplate. On rod *F* was a sliding arm *H* made tight with a clamping screw. The setting of this arm gave the desired center distance, which could be changed to suit.

Every part of this jig was made of cold-rolled steel, cyanide hardened, except the drill bushings.

Formerly every nipple had to be centerpunch marked individually, clamped and drilled; a production of 10 to 20 per hour being reached. With this jib the production is from 30 to 50 per hour according to size of pipe and drill. The size of the drills ranges from $\frac{1}{16}$ to $\frac{5}{8}$ in.

An Adjustable Boring Tool

BY CHARLES SEHL



AN ADJUSTABLE BORING TOOL

The sketch shows an adjustable boring toolholder for small work. The screw *A* adjusts the cutting tool, by causing the holder to spring at *B*. For larger holes than can be taken with the solid boring tool, a boring tool set in a holder as shown at *D* can be used and the cutter *E* set-out to the diameter of the hole when starting to bore. At the end of the screw *A* the holder can be opened at least $\frac{1}{16}$ in. without any danger; this will move the boring tool about three times that distance. Since there is seldom more than $\frac{1}{32}$ in. to be bored out of small holes this range of adjustment will be ample to cover nearly all cases in ordinary practice.

What Comes of Running a Lathe Backward

BY JOHN J. HILL

Some time ago I read in the *American Machinist* that a good way to prevent chatter in using a long boring tool is to turn the tool upside down and run the lathe backwards. Having the usual trouble in boring out a brass cylinder 10 in. in diameter by 12 in. long, I suddenly remembered this sovereign remedy and determined to apply it.

I turned the tool over and started the finishing cut. I was delighted with the result; the lathe ran quietly and the finish was a smooth glass-like surface. Figuring that the job would take care of itself for quite a while, as it was running so nicely, I decided to go over across the shop and "visit" with a shopmate who was running the planer.

As I stood talking with my friend, with my back turned to my own job, I was startled by a sudden commotion culminating in a grand smash, and I looked around to see my lathe surrounded by an excited crowd (which included the boss) all trying to do something at once.

I made the distance back to the wreck in two jumps and as soon as I could wedge my way to the front row of spectators, found that the faceplate had unscrewed and dropped the whole "works" on the shears, breaking the boring tool, wrenching the casting free from its holding straps and otherwise injuring the appearance of the job and the feelings of the boss who directed to me several sarcastic remarks about "going to bed nights," "staying on my job in the day time," "learning which way a lathe ought to run," et cetera.

Thus ended my first practical lesson in chatter prevention. Now, when I have trouble from this source I turn the tool upside down, but I put the cut on the backside of the work and run the lathe forward. I find that it works just as well and I do not expect to see the faceplate fall off.

[We think the boss was right.—EDITOR.]

Support Your Cutting-Off Tool Solidly

BY JOHN P. WHEELER

I have often noticed the difficulty the average toolmaker has in using a cutting-off tool in the lathe and offer my experience as a remedy.

I served my time in an old English shop and many years ago got my first introduction to an American lathe, a "Davis & Egan," and was charmed with it until I had to use a cutting-off tool. It took me about a month to discover why I had trouble but once I did find out the cause all my troubles disappeared.

The main difficulty is caused by the rocker. If any lathe hand will take the rocker out, reverse the plate, and pack the cutting-off tool level with the center by means of solid packing, having the tool flat on top and with very little clearance on the cutting edge he will be delighted with the result.

I have shown this scheme to hundreds of lathe hands at different times but I still find in every shop I go into the new crop of mechanics having the same trouble with cutting-off tools. The rocker is not solid enough and easily slips down under strain causing the well-known "dig." I generally use the same means for holding forming tools. The extra trouble of packing the tool up is well repaid.

IN THIS ISSUE

DIXIE in the first article in this issue goes very much into detail concerning the use of paper in the machine shop. He tells of the assistance that paper affords the skilled mechanic in taking his many precautions to insure accuracy; how it hinders slippage and prevents injury to machine tables, and how it is used as feelers. The proper use of paper is commendable and the practice of using it is so universal that we are glad indeed that Dixie has set down the facts contained in his article.

In the next article, which begins on page 852, Western Editor Hunter describes special equipment used in a railway boiler shop. There is a great deal that may be learned from boiler shop work and Hunter has bent his energies to selecting for description machines and devices certain to be of universal interest.

We go deeper into the design of helical springs this week in Joseph Kaye Wood's third article beginning on page 854. It will be remembered that in a previous article Wood devised special formulas for helical spring design and introduced the terms "material index" and "spring criterion." This week he takes up the method of controlling the spring criterion and analyses the actions that take place when coiling a spring by means of rollers or by means of burnishing, which is a combination of spring winding and coiling. One of his conclusions is that coiling and burnishing will produce a better or more permanent set in the forming of a helical spring, and are therefore recommended.

The matter of cost accounting has not kept pace with development in many other lines. Though we suppose that in some fields it has reached a very high degree of development, in the machinery industry it has not progressed nearly so far as possible. In this installment of "Modern Production Methods," under the title "Getting the Overhead Into the Finished Product," W. R. Basset deals with the methods of checking costs and the distribution of various charges to the proper departments. In referring to the old system of keeping cost accounting entirely separate from the general accounting of a business, Mr. Basset says, "Unless the cost system ties in frequently with the general items of account, we have no check on the accuracy of the costs and the system in effect would be the inaccurate, old-fashioned, single-entry system. As usual the article includes many sample forms." Page 858.

We hope that many of our readers are following the series on "Tool Engineering." We have promised that this is to be a great series and we believe that the first three installments have borne out our statement. The fourth installment, page 864, continues the treatment of drill jig design. Clamps are featured and part of the article is devoted to spring plungers and jacks.

It so happens that we are able to run in the same issue with the story of the use of paper an article by John Slocumb dealing with the use of wood in the machine shop, particularly wood blocking and bar work. It tells of the use of wood in holding work, in the construction of boring and facing bars that are held on lathe centers, of threading with a boring bar, and of parallels made of wood. An interesting statement that Slocumb makes is this: "In the average machine shop today there seems to be a prevailing belief that to set up a wooden block is unmechanical and sloppy. I have used the lathe largely in boring with boring bar on centers and consider this way for many kinds of work equal if not superior to any other." This interesting article begins on page 868.

Ellsworth Sheldon's seventh magnetic chuck article, page 871, goes into the details of the Simmons chuck which was invented by Frank L. Simmons of Millbury, Mass., to whom a patent was granted in 1918. This patent was immediately assigned to the Taft-Peirce Company in whose shop the chucks are now built, under the supervision of the inventor.

It was a very earnest and broad minded group of men who met at Cleveland earlier in the month in response to the call of the National Foreign Trade Council, to consider the important problems relative to foreign trade and general business, now pressing. After the many addresses of merit had been delivered and full discussion held the convention drew up the final declarations which we publish on page 875. If the suggestions embodied therein can be followed out not only will foreign traders benefit but the good effects will be felt by all those engaged exclusively in domestic commerce.

Coming Features

Next week we will have an article on "Planning and Controlling Production in a French Shop," by E. Jullien of Savy Jeanjean et Cie., Courbevoie, France. The author has been generous indeed with his information and has included in his article examples of stores requisitions, record cards, routing cards, schedules and tool sheets. He describes a very interesting device known as a revolving calendar, which is a part of the production scheme.

Of series articles there will be the fifth of "Tool Engineering," the tenth of "The Foreman and His Job," and the tenth of "Metal Cutting Tools."

Hunter will have an article on testing equipment for pneumatic motors that should be of universal interest because pneumatic motors are used everywhere.

We shall begin the fourth of A. B. Cox's gear articles dealing with the slipping of involute gear teeth. The article is so long that it will have to be continued the following week.

View points of some of the foreign trade experts who took part in the convention at Cleveland will be found in the abstracts of addresses which will appear in th next issue.

EDITORIALS

We Must Finance Foreign Trade

PROBABLY the most lasting conviction carried away from the Foreign Trade Convention was that foreign trade has become a necessity for the United States and that it is not confined to export, but includes sufficient proper import.

There isn't a great deal of foreign trade enjoyed by the United States right now, little export because of commonly known and very obvious causes, and little import because the nation hasn't come to know it as a necessary reaction to export.

The convention did more than decry conditions. It made many constructive suggestions and went on record in its final declaration as backing up a program that is going to mean business if carried through. Of particular significance was its stand and the stand of individual speakers on the advisability, actually the necessity, of doing something definite to finance foreign trade. Former Secretary of Commerce Redfield, president of the American Manufacturers' Export Association, in urging the development of the Foreign Trade Financing Corporation, said, "I know personally of orders from other countries available to the United States at the present time, of more than $20,000,000 which can be closed just as soon as the corporation operates.

"It is not a question of whether this company ought to be formed and put into operation, but one of our standing at the parting of the ways and deciding whether we shall go down, though possibly not out, or whether we shall go up and stay in the game. Those of you who have had experience with competitors in Europe have no illusions as to the quality of the competition we have to meet, or doubts about our ability to compete with them, but we are without the tools. We have reached the end of our financial power with the tools which we have, and unless new tools are created speedily we have reached the end of our useful activities in export trade."

The Convention in its final declaration includes the following: "We urge the immediate creation of financial institutions under the Edge Law, whose machinery will facilitate extension of long-term credits to promote free exchange of exports and imports. We commend efforts to acquaint our investing public with the necessity of purchasing debentures issued by such institutions against approved foreign securities for this purpose, so that eventually every community will serve its own vital interest in furthering our foreign commerce as a necessary component of domestic prosperity."

We could give many other quotations and they all point the same way. There is no room left for doubt as to the advisability of getting this machinery going. The plan has been O.K.'d by the business group more immediately, but probably no more intimately, affected by foreign trade. Just now the thing that must be done is to overcome the existing spirit of apathy. Unfortunately "let George do it" seems to be the accepted, if unexpressed, slogan of many who should be right on the firing line.

No Place to Economize

RESOLUTION number ten, adopted by the Chamber of Commerce of the United States, reads in part:

"The Department of Commerce is now charged with the primary duty of rendering the fullest possible service to American commerce, both foreign and domestic. It has no inquisitorial or regulatory powers and is accordingly free from the equivocal duty of restraining business with one hand while it attempts to offer service with the other.

"This Department is in a peculiarly favorable position to obtain, co-ordinate and distribute vital commercial information, carefully safeguarding all confidential facts. It can render invaluable service through the development of commercial standards and specifications, the absence of which is costing the American people at the present time hundreds of millions of dollars.

"The Chamber strongly recommends that the facilities of the Department of Commerce be broadened to meet the actual and economically proper demands of the business of this great nation. It recommends further that those federal bureaus and divisions, the duties of which upon study are found to fall within the scope of the Department, be included in the Department.

"The Chamber believes that the prompt consummation of this plan will give a decided impetus to the revival of business both domestic and foreign at a time when such revival is proving a slow and arduous process; and that the service thus made available to American business will contribute substantially to reducing the suddenness and intensity of future business depressions through establishing a more accurate and reliable basis of available facts . . . ."

This invaluable and vitally necessary work cannot be carried on without funds. On first glance it might seem that a large sum of money would be required to make even a start on the task. The amounts asked from Congress by Mr. Hoover are $250,000 for the collection, handling and dissemination of commercial information, and $350,000 for the study of standardization and elimination of waste problems at the Bureau of Standards.

The sum of these two appropriations would be just enough to support a battalion of troops for one year. The comparison is significant.

Incidentally, the money so spent would be productive of actual savings considerably in excess of the expenditure, aside from any other consideration.

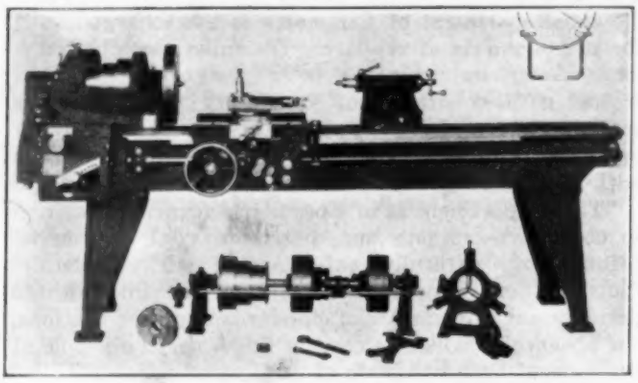
This appropriation will not be obtained without a fight and it must have the weight of public opinion behind it to get it across. Resolutions like the one quoted are all very well, but the average Congressman needs to hear from the folks back home before he is ready to take action that will bring down the wrath of the demagogs upon his head. It is the duty of every manufacturer and business man in the country to sit down and write to his representative telling him what he wants him to do.

Here is a chance to do something tangible to assist the man who has undertaken to make the Department of Commerce a real aid to business and industry.

Shop Equipment News

Carroll 14-Inch Quick-Change Lathe

The accompanying illustration shows the 14-in. quick-change-gear lathe recently placed on the market by the A. V. Carroll Machine Tool Co., Norwood, Cincinnati, Ohio. The chief feature to which the maker calls attention is a gap by which the swing over the ways is increased to 19 in. for chuck and face-plate work. The gap in the bed is not visible from the front or the back of the machine, since only the inner ways are broken, the outer or carriage ways remaining. The small sketch at the upper right-hand corner of the illustration shows the construction used for the gap bed, the section shown extending for a distance of 9 in. in front of the headstock. It is said that the feature adds greatly to the adaptability of the machine, and does not weaken the strength of the bed.



CARROLL 14-IN. QUICK-CHANGE LATHE WITH INVISIBLE BED GAP

Specifications: Swing; over bed, 16¼ in.; over bed with gap, 19 in.; over carriage, 11 in. Spindle bearings; front, 2¼ x 4 in.; back, 2 x 3 in. Diameter of spindle nose, 2⅞ in. Hole in spindle; through, 1⅝ in.; taper, No. 3 Morse. Back-gear ratio; single, 9 to 1; double, 9 and 3 to 1. Diameter of tail stock sleeve, 1¾ in. Length along ways; carriage, 22 in.; steady rest, 4 in. Countershaft; pulley, 10 in.; speed, 225 r.p.m. Distance between centers with 6-ft. bed, 40 in. Weight with 6-ft. bed; net, 1,650 lb.; boxed for export, 1,950 lb.; weight per additional foot of length, 90 lb. Export box, 29 x 29 x 84 in.

The drive is by belt on cone pulleys, either three- or four-step pulleys being provided. Either double or single back gears can be furnished. The headstock is of bowl shape, all gears being covered. The gears in the head are steel, and the bearings are of bronze. The spindle is of 50-point carbon steel and ground to size. It is constructed with a large opening throughout its entire length for bar work. The spindle is said to be in line with the bed and carriage with an error not exceeding one-thousandth of an inch in 16 in. The head and gear box can be elevated by means of raising blocks so as to increase the swing of the lathe to 20 in. It is said that it is not necessary to alter the intermediate gearing when making this change, which can be quickly performed.

The quick-change gear box for obtaining feeds is equipped with steel gears. By the positioning of one knob and handle, 24 changes of feed, either right or left, can be obtained. The lead screw has a four-pitch thread, and is adjusted by means of a threaded collar.

The carriage is fitted with gibs at both the front and back. It is arranged to receive a taper attachment when desired.

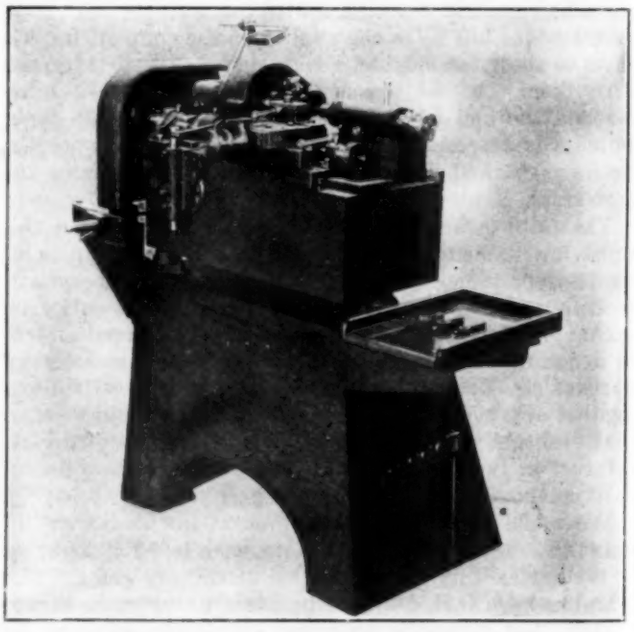
The gears and studs in the apron are of steel and bronze. An interlocking device is provided, so as to prevent breakage, making it impossible to engage both the screw and the feed at the same time. A reversing mechanism permits of either right- or left-hand feed. The compound rest is provided with taper gibs, and its bottom is graduated so that it can be swiveled. The tailstock can be set over for taper turning. The centers are self-discharging.

The machine can be furnished in lengths of bed of 6, 8, 10 and 12 feet. The equipment consists of large and small faceplates, a follow rest, steadyrest, centers, wrenches, thread indicator and a countershaft provided with double friction clutches.

Herbert Precision Screw Lathe

The accompanying illustration shows a precision lathe intended for the cutting of accurate threads, as on gages, and recently introduced to the American market by Alfred Herbert, Ltd., Coventry, England, through offices at 50 Church St., New York, N. Y.

The bed of the machine is of box section and rests on three balls so secured to the base as to allow free expansion or contraction with temperature changes. The headstock is fitted with a three-step cone pulley, driving the spindle through gears with a speed reduction of 4 to 1. The lead screw is, in turn, geared to the spindle. The work center does not revolve. The tailstock has a fine adjustment across the bed. The saddle carries two



HERBERT PRECISION SCREW LATHE

Specifications: Capacity; maximum diameter, 2¼ in.; admits between centers, 3 to 6 in.; maximum length threaded, 3 in. Number of spindle speeds; forward, 3; reverse, 3. Spindle speeds; forward, 80, 40 and 20 r.p.h.; reverse, 110, 55 and 22.5 r.p.m. Countershaft pulleys, 8x1¾ in. Horsepower required, 1. Floor space, 4 ft. 10 in. x 2 ft. 8 in. Weight; net, 1,596 lb.; gross, 2,239 lb.

slides, the top one having an eccentric bushing which permits adjustment of the height of the tool. By means of a micrometer stop reading to 0.0001 in., the correct depth of cut can be obtained by the top slide. The intermediate slide has a micrometer adjustment lengthwise for side cutting.

The lead screw has a square thread, there being eight threads per inch. It is placed between the V's of the bottom slide. A solid nut is used. The shank of the tool is ¾ in. in diameter. A pitch-varying attachment is provided, so that the proper allowance for the change in length of the work during hardening may be quickly made. By means of a grinding and lapping fixture, the thread-cutting tools can be finished to the exact angle required.

Langelier Special Automatic Multiple-Spindle Drilling Machine

A six-spindle machine of the dial type for drilling the tumbler holes in pin-tumbler lock cylinders has recently been completed by the Langelier Manufacturing Co., Providence, R. I., and is shown in the accompanying illustration. At the top of the illustration are shown the cylinders, with the holes for the small pins or "tumblers" that prevent the plug of the lock from turning, except when the proper key is applied. Jig drilling is, of course, a necessity, but the holes are so closely spaced that a multiple-spindle, single-position machine would be impracticable. This machine operates upon the progressive principle.

Seven positions are provided, one for each of the six holes and one for unloading and reloading. The jigs are equidistantly spaced upon a large horizontal dial and so arranged as to open and close automatically at the proper time. A slide at each position carries a short, horizontally projecting arbor fitting the plug-hole in the cylinders to be drilled. A bushing plate guides the drills. As the jig closes, the slide advances until the end of the arbor enters a closely fitting bushing in the fixed part of the jig, thus clamping and locating the cylinder.

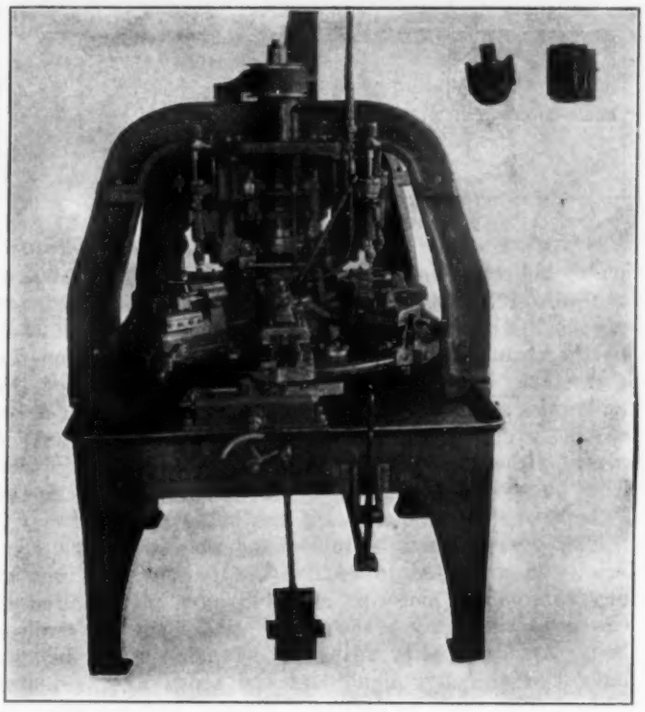
A roller, projecting below the slide, engages the stationary cam upon the table as the jig comes to the loading position, drawing back the slide and allowing the operator to change the piece of work. The jig may be closed at any time by the pressure of the operator's foot upon the treadle; but ordinarily there is no reason for doing this, as the closing movement takes place automatically when the dial carries the jig forward.

The main drive of the machine is by belt to the pulley at the upper end of the vertical, central shaft, from which all the movements are derived. A spur gear upon this shaft drives six short vertical countershafts, from which the drill spindles are driven by web belts, each provided with an independently adjustable idler to take care of the belt tension. The spindles run at 5,000 r.p.m., and are mounted upon ball bearings.

The cams for moving the dial and for advancing the drills to the work are located under the machine table, out of the way of chips. The dial rests upon an annular bearing surrounding the central shaft, and the movement of the drill spindles is taken from a sleeve that slides upon the hollow boss, projecting upward from the stationary table in which the central shaft has its lower bearing. The spindles are all connected by toggles to this sleeve, which, in turn, receives its movement from a cam under the machine.

The dial is moved by a modified form of the "Geneva" gear, the single toothed member of which is keyed to the camshaft beneath the table of the machine. The locking bolt that locates the positions of the dial is near the periphery of the dial and has its bearing below the table. Independent vertical adjustment of the drill spindles to compensate for wear of the drills is provided by the knurled head screw above each spindle.

Because of the nature of the material, no lubricant is used, but the machine is piped to deliver a jet of air



LANGELIER SPECIAL AUTOMATIC MACHINE FOR DRILLING TUMBLER HOLES IN LOCK CYLINDERS

upon the drills and thus keep down their temperature while at the same time keeping the work clear of chips. The machine will deliver eleven completed cylinders per minute, it is said.

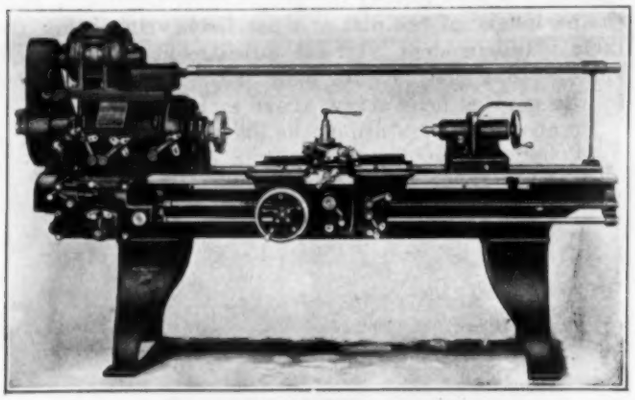
Morris Geared-Head Lathe

The Morris Machine Tool Co., Court and Harriet Sts., Cincinnati, Ohio, has fitted with a geared head and single-pulley drive its quick-change lathe of the type previously described on page 478, Vol. 52, of the *American Machinist*. As shown in the illustration, the machine is driven by an individual motor mounted on top of the headstock. The lathe is made in swings of 16, 18 and 22 inches.

The head provides twelve spindle speeds, and by using a double-clutch countershaft either twenty-four speeds or twelve forward and twelve reverse speeds can be obtained. The speed range for the 16-in. lathe is 12 to 347 r.p.m., while it is 10 to 297 r.p.m. for the 18- and 22-in. lathes. All the gears are of steel, heat-treated and hardened. The headstock is partly filled with oil, permitting the gears to dip enough to thoroughly lubricate them.

All speeds are secured through sliding gears and one positive back-gear clutch. The only friction clutch used is in the pulley at the initial drive, the clutch being of large diameter and controlled by a shifter rod run-

ning the full length of the lathe, thus permitting the operator to start and stop the lathe from any working position. When releasing the friction clutch in the



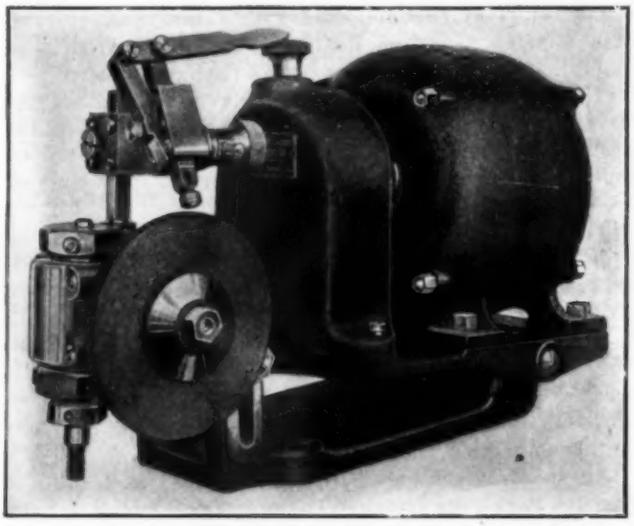
MORRIS GEARED-HEAD LATHE

pulley a brake can be applied by the same pull to stop the idle rotation of the spindle. This action is of use both when shifting gears and when turning work partly around for inspection at different points on the diameter. Speed changes are made by means of the levers in front of the head. When the direct-drive clutch is engaged the back-gear pinion is put out of mesh, preventing the back gears from running idle. The pulley is protected by a guard which can be swiveled to suit the angle of the belt.

The geared head is interchangeable with the cone head and arranged to receive the motor-drive unit at any time. The motor is mounted on a plate bolted to the head and drives the clutch pulley by an endless belt. An idler pulley adjusts the tension of the belt by means of the star handle at the front of the motor plate. The idler pulley and bracket are mounted on the motor plate, making the motor-drive unit self-contained.

"Universal" Thread-Milling and Grinding Attachment

The Automatic Machinery and Equipment Co., 1110 Land Title Bldg., Philadelphia, Pa., has recently placed on the market a machine for attachment on the tool-



"UNIVERSAL" THREAD-MILLING AND GRINDING ATTACHMENT

block of a lathe, for use in milling and grinding threads and worms. It is known as the "Universal" because of its wide range of adaptability, and it is adapted to production work of different sorts. The machine will mill, flute and grind a tap in one setting, besides milling worms and cutting gears and ratchets. It can be used for drilling jigs and fixtures, splining shafts, and doing both internal and external grinding.

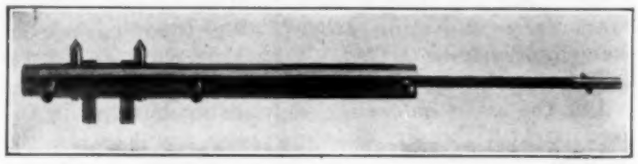
The illustration shows the Size "A" machine, fitted for grinding. There is a spindle, shown at the bottom of the spindle head, for holding the milling cutter. The head can be swung to bring the spindle in the desired position, it being graduated for the full 360 deg. to facilitate setting.

The driving motor is mounted on a base hinged on the main base, so that the spindle can be raised or lowered. The motor base carries a quick-change gear box, which is interposed between the motor and the spindle head. The spindles are fitted with ball thrust bearings, and run in oil in adjustable bronze bearings. The spindles and gears are made of heat-treated alloy steel.

A diamond truing device is furnished for dressing the grinding wheel to any desired angle. The equipment includes a diamond, an internal adapter, grinding wheels and wrenches. The motor can be furnished to suit the current available. The length of the machine is 14½ in,, the width 6 in., and the height 8 in. The weight is about 45 lb.

Van Keuren Micro-Gage Holder

A set of accessory measuring tools, for use with the combination micro-gage blocks manufactured by the Van Keuren Co., 361 Cambridge St., Allston, Boston,



VAN KEUREN MICRO-GAGE HOLDER

Mass., has recently been placed on the market by the same concern. The device, shown in the accompanying illustration, is a holder for the gage blocks and the measuring points, forming a caliper. The micro-gages, which are round in shape, permit the use of a light steel tubing for the frame or clamp to hold the micro-gages and the jaws. The micro-gages are inserted in the lower or open end of the tube, and the jaws are inserted in ¼-in. slots.

The three sets of staggered slots, instead of one long slot, retain the rigidity of the steel tube. Pressure on the clamp screw release button at the top of the tube permits the clamp screw to be moved quickly to accommodate any combination of gages or jaws. The clamp has a range up to 7 in. Small dimensions are secured with the jaws in the central slot. For long combinations the two end slots are used.

The measuring jaws include two flat jaws 0.300 in. in thickness, two plain 0.250-in. plugs and two 60-deg. 0.250-in. scribing plugs. A base block 1 in. in thickness, held in place by one of the 0.250-in. plain plugs, permits measurements to be established at a definite height above a surface plate. The two flat jaws being of a definite thickness may, when separated by the desired combination of gages, be used for either inside or out-

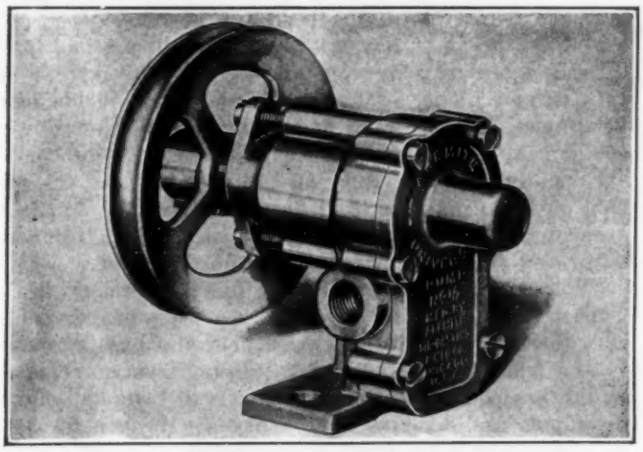
side measurements. The plain plugs are likewise used for measurement of the diameters of holes or the smallest or largest distance between parallel holes. The 60-deg. plugs are used for trammel points, for checking the lead of threads, for scribing lines and for locating height dimensions.

All of the measuring parts, being of simple construction embodying plain flat or cylindrical surfaces, are said to be as accurate as the micro-gages themselves.

Alemite Universal Pump

The Alemite Die Casting and Manufacturing Co., 2640 Belmont Ave., Chicago, Ill., makes a line of pumps of the type shown in the illustration. The pumps are made in five sizes with a range of capacity from ½ to 10 gallons per minute, when run at their rated speed of 300 r.p.m. They are adapted to the handling of differnt sorts of coolants, oils and heavy fluids.

The parts are made of die castings chiefly, by the



ALEMITE UNIVERSAL COOLANT PUMP

Specifications: Made in five sizes, Nos. ½, 1, 3, 5 and 10. Respective capacities, gallons per minute at 300 r.p.m., ½, 1, 3, 5 and 10. Size of inlet and discharge openings, ¼, ⅜, ½, ¾ and 1 in. Net weight, plain type, 2, 4½, 6¾, 9¼ and 15½ lb.

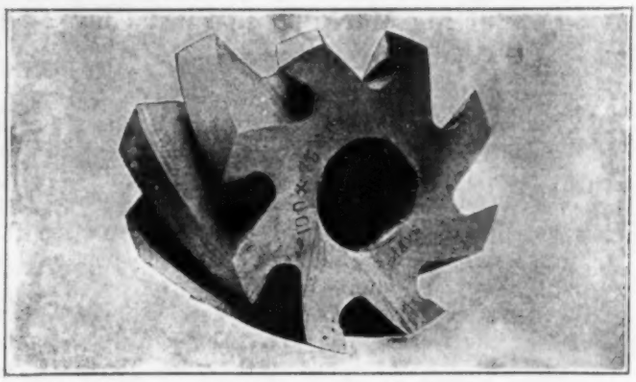
methods which the company has developed in its die-casting business. The casing and cover are bolted together by means of capscrews, only a light coat of shellac being used to prevent leakage, therefore avoiding the use of gaskets. The bearing on the drive shaft is provided with a large gland with a take-up to prevent leakage. The drive shaft can be extended to receive any desired type of power transmission. There are only four moving parts, the crankhead, rotor, oscillator, and the extension.

The rotor is constantly kept in contact with the casing by means of a spring placed between the shaft and crankhead, which construction allows for the passage of any foreign substance such as dirt or grit through the pump, thus preventing clogging. The pumps are made of a hard, high-tensile-strength metal, especially adapted for this purpose.

Savy Helical Milling Cutter

The type of milling cutter shown in the accompanying illustration is made by A. Savy, Jeanjean & Co., Courbevoie, near Paris, France. The mill can be furnished in various sizes and numbers of teeth. The helix angle is 30 deg. The wide-spaced teeth are undercut, and have a rake of 10 deg. To sharpen, they are ground on the front faces only.

Besides the high metal-removing capacity of the cutters, the following advantages are claimed for the tool: First, the 30-deg. helix angle eliminates the chatter,



SAVY, JEANJEAN & CO. MILLING CUTTER

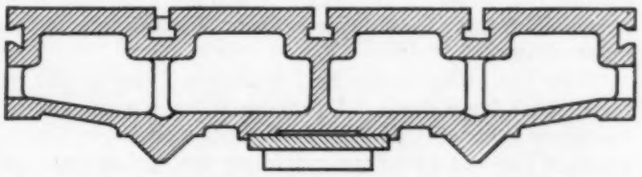
particularly with a deep cut; second, no chip breakers are required; third, the tooth is very much stronger than in a standard cutter; and fourth, the sharpening of the cutter does not decrease the chip space, but on the contrary, it increases it.

It is stated that a 4-in. diameter cutter of the type shown when under test took a cut 2½ in. wide and ½ in. deep in medium-hard cast iron at a speed of 62 r.p.m. and a feed of 20 in. per minute. The cutting speed was 65 ft. per minute, and 25 cu.in. of metal was removed per minute, only 12½ hp. being absorbed by the milling machine. The cutter was in perfect condition after one hour of such service.

Box-Form Table for Gray Planer

The illustration shows the box type of construction used for the tables of the planers recently made by the G. A. Gray Co., Cincinnati, Ohio. The objects which this design seeks to attain include ease in cleaning, freedom of the V's from chips and dirt, and a greater degree of rigidity. In order to further stiffen the table, the top and bottom surfaces are firmly tied together by a heavy, uninterrupted vertical wall of metal running the entire length of the table on its center line. On each side posts of metal serve the same purpose, while permitting the operator to clean the chips from the cored portion of the table. The cored openings in the outside walls are designed to leave a sufficient amount of metal while still permitting access to the interior. Heavy transverse walls at two-foot intervals provide against arching under the strains imposed by the clamps and stop-pins.

The stop-pin holes pass entirely through the table top, thus permitting the chips to fall through and leaving the holes clear. The cleaning is done from the side



SECTION THROUGH GRAY BOX-FORM PLANER TABLE

of the table, lessening the danger of pushing chips into the V's. Wide and deep chip pockets are provided at the ends of the table, to safeguard the V's and the gearing against chips.

Johnson Gets Ready for Business

Discarding Wornout Equipment—Getting Ready for Competition—Rearranging the Shop, Putting Machines in First Class Shape—Painting the Shop and the Machines

By JOHN R. GODFREY

I'VE been having several confabs with Johnson during the winter but as he asked me not to spill it all over the map, I just naturally had to sit tight. He has his plans fairly well worked out now and he's so dead sure he's got it all doped out right he gave me the Admiral Dewey high sign of "You can fire when you are ready, Godfrey." So here goes.

"We're in for a slump Godfrey—can't be helped. You can't tear the world up by the tail for five years and keep on picking watermelons all the time. We've danced and now we must pay the fiddler, and the deuce of it is a lot of wall flowers who never even got a bid to trip the light fantastic, have to chip in just the same.

"There's no use fooling ourselves about either profits or losses. Most of us made more than any real patriot should and we ought to bear our loss like a soldier. I'm going to charge off my losses as due to the drop in materials p.d.q. or sooner, and take business at the present price of cast iron, not what it was a year ago.

"I figure out that the country has a surplus capacity for manufacturing most things mechanical, which means that some shops are going to be partially idle a long time unless they find something new to manufacture. A lot of the weaker motor builders must just naturally go broke. They haven't production capacity enough to turn out motors at a price to meet the big shops that are well equipped. And some of the big plants are likely to get fed up with dollars on the wrong side of the ledger too.

Saved His Profits

"Now I figure to stay in the game. I tucked away my extra profits where I can get them and I'm going to use a wad of that easy money within the next few months. I didn't blow my cash on twenty-thousand dollar limousines like some of my friends. Just now they are cussing out the workman who bought a silk shirt and a victrola as not being thrifty. Don't seem to see that they come in the same class.

"As I said before I figure to stay in business, but all the figuring in the world won't do it unless I can produce motors as economically as the rest of them. So I've been going over my shop with a fine tooth comb to see what machines ought to be replaced. And believe me there's a bunch of 'em.

"We've been charging off 10 to 15 per cent depreciation on machines until we owe them money. We've kidded ourselves into believing we were putting it over on the tax collector by using machines that had been charged off long ago. We've been loosing money on most of 'em.

"Now I'm ordering the best machines I can buy to replace these lame ducks. I propose to have gear cutting machines that will cut time to the bone on those timing gears. The old grinding machines are going out and newer ones coming in. The same with cylinder boring machines. I may pay a little more for them than I would later but I'll have them ready for business while the other fellow is thinking about ordering.

"We're going to have real competition, Godfrey, such as we never had before. And the chap who thinks he is saving money by hanging on to his old machine equipment is licked before the show starts. He won't even hear the band. And he's the calamity howler who will raise his melodious voice in protest about unfair competition and ruinous prices for motors, when the aforesaid competition gets into action. Prices will be ruinous all right to the man who thinks a fifteen-year old milling machine is good enough for crankcases and the like. But the shops with real machine equipment will get the business at a fair margin, if they are at all well managed.

"Then there's the wage question. The alleged manager who don't realize the need for new machinery or hasn't the nerve to buy it if he does, will probably try to reduce his costs by cutting wages. And even if he gets away with it, which he can of course, if his men get hungry enough, he'll find many disappointments in the game. A man may take a big cut because he has to eat once in a while. But you can just imagine the joy he'll put into his work and how hard he'll try to make every move count for the boss—*not*. It isn't human nature on one side any more than on the other.

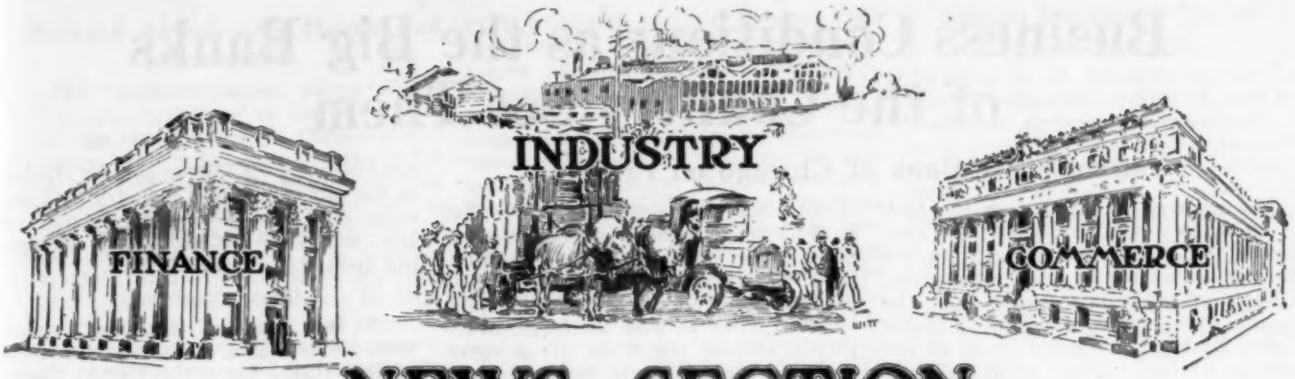
"Wages must probably come down in many lines. They were shot out of sight because the workmen could club the employers into paying them and passing it on to the consumer. They took lessons from our sugar philanthropists and others. They both blame it all on old supply and demand—when they get the benefit. But its downright outrageous and unpatriotic when an unskilled laborer wants a 10 per cent boost.

Machinists Wages Were Too Low

"Mahcinists' wages have always been too low considering the skill and training they had to have. When a bricklayer can get more money than a skilled toolmaker, there's something wrong somewhere, and especially when we consider that the bricklayer doesn't have to have as much real skill and knowledge as a first year apprentice. I'm hoping to keep machinists' wages up where they are now. But we've got to have more production, both from the men and the machines. We all slumped after the war stopped and we've got to spit on our hands and get busy in a hurry.

"I've had a few talks with our men and I believe they see the light. We've discussed the new machines and what they ought to do. We've laid the cards on the table, face up, and I'm counting on the men to help me put things over as soon as the consumer gets up his courage enough to order. In the meantime we are rearranging the shop, putting every machine in as good condition as possible, painting machinery green and the walls white, and investing a lot of time and money against future business."

If more managers had Johnson's genuine optimism instead of the kind that talks good business and doesn't spend a dollar for needed equipment, we'd have started on the up grade long before this. Johnson's plan isn't especially new, but I'll gamble on his making it go when there is a chance at getting orders.



NEWS SECTION

Machine Tool Builders Hold Regional Meetings

E. F. Du Brul, general manager of the National Machine Tool Builders' Association, has announced a second series of regional conferences following the lines of the successful ones recently held on cost accounting practice. Meetings in this series have been held at Dayton, Indianapolis, Rockford, Milwaukee and Grand Rapids. Others will be held in the near future at Cleveland, Cincinnati, Rochester, Boston, Worcester, Hartford and New York.

American C. of C. Organized in Egypt

The American Chamber of Commerce of Egypt, with headquarters at Alexandria, has been formed by business men of Alexandria and Cairo, according to information received by the Foreign Commerce Department of the Chamber of Commerce of the United States. The officers of the new chamber are: President, P. N. Macdonald, general manager, Vacuum Oil Co., Cairo; first vice-president, R. Chesbrough, manager, American Foreign Trade Corporation, Alexandria; second vice-president, William Yale, H. Gill & Co., Alexandria; secretary, Henry Gill, H. Gill & Co., Alexandria; treasurer, M. Kallman, Livermore, Rojas & Co., Cairo; directors, T. Khayat, Charles Barnett Co., Alexandria and P. Sasso, Alexandria.

The American Consul at Alexandria was elected honorary president of the chamber.

With seven steamship companies operating direct steamship service to Alexandria from the United States and with many American houses interested in the extension of their trade through Alexandria as the distributing point, not only for Egypt, but also for Syria, Palestine and the Sudan, the establishment of an American Chamber of Commerce in Egypt had become a matter of urgent need. American business concerns interested in the services of the American Chamber of Commerce of Egypt can communicate with the secretary, Mr. Gill care of the Chamber at Elexandria, Egypt.

Importers and Traders Elect Officers

After two preliminary meetings at which an organization was started and perfected, the National Council of American Importers and Traders met at the Hotel Pennsylvania, on May 6, and after adopting a constitution and by-laws, elected the following officers for this year: President, N. E. Franklin, of Kny-Scheerer Corp. of America; first vice-president, Peter Fletcher, of Lamb, Finlay & Co.; second vice-president, William S. Pitcairn, of William S. Pitcairn Corp.; third vice-president, F. Bode, of Gage Bros.; fourth vice-president, A. B. C. Dohrmann, of the Dohrmann Commercial Co.; treasurer, H. O. Lloyd, of Julius Kayser & Co.; secretary, Franklin Van Leer, Jr.

A board of directors, comprising many of the largest importing houses in the country, was also elected. They were chosen so as to have, as far as possible, every commodity represented.

The object of the council is to unite American importers for the purpose of promoting the general welfare of all import interests; to render such assistance by advice and counsel as may be necessary from time to time; to obtain and render such counsel to importers and customs authorities as may be necessary to further the extension of import trade and commerce; to make a careful and unprejudiced study of all new governmental measures proposed for the welfare of our country and its commerce, so that every phase may be considered, and not to make either objections or recommendations on any proposed law or regulation until such study shall have been completed.

The council, though only in its infancy, has a membership of 150 of the most prominent trading houses in the country. It was reported at the meeting that there are over two hundred applications on file and inquiries are coming in every day. A vigorous campaign in behalf of the council and its aims will be undertaken at once by the officers just elected. The council has already made itself felt as the champion of American import trade by its fearless stand on the tariff question before the Ways and Means and Finance Committees at Washington.

Awards Made in Simonds Essay Contest on Economics

The prizes offered by Alvan T. Simonds, president of the Simonds Saw Manufacturing Co., of Fitchburg, Mass., to encourage the study of economics in high schools and normal schools, have been awarded. The prizes consisted of $1,000 and $500 for the two best essays on the subject "Present Economic Conditions and the Teachings of Adam Smith in the Wealth of Nations."

The first prize of $1,000 was won by David Koch, of the High School of Commerce, New York City. Second prize of $500 went to Aloysius Thiemann, Reedsburg High School, Reedsburg, Wis.

Essays were submitted from every section of the United States and from Canada. Practically every state was represented. A very large proportion came from New York City, where the study of economics is required of all seniors in the high schools.

The judges were Wallace B. Donham, dean of the Harvard School of Business Administration, Cambridge, Mass., and John G. Thompson, principal of the State Normal School, Fitchburg, Mass.

Census Statistics on Manufacture of Aircraft

A preliminary statement of the general results of the 1920 census of manufactures with reference to aircraft has been issued by the Bureau of the Census, Department of Commerce, furnishing a detailed statement of the quantities and values of the different types of aircraft manufactured during the year 1919.

Reports were received from 31 establishments engaged in the industry during 1919 showing products for the year valued at $14,372,643, as compared with 16 establishments in 1914 with products valued at $789,872. Of the 31 establishments reporting for the year 1919, 10 were located in New York; 4 in Ohio; 2 each in California, Massachusetts and Missouri; and 1 each in Connecticut, Indiana, Illinois, Louisiana, Maryland, Nebraska, New Jersey, Pennsylvania, Rhode Island, Washington and West Virginia.

Business Conditions as the Big Banks of the Country See Them

National City Bank of Chicago on Prices

The country is engaged in the task of trying to secure for the ultimate consumer the benefits resulting from the drastic reductions in wholesale prices. This is of great importance since the figures given out by the United States Labor Board reflect a decline of 38 per cent in wholesale prices since last July and an average level now only 62 per cent above that of prewar period as against a 118 per cent increase shown at one time last year. There is abundant basis for the statement made to the President by the Federal Trade Commission that retail prices were not being reduced in proper ratio to the decline in wholesale prices. The official figures covering the decline in foodstuffs indicates a falling off of 22 per cent for the year ending March 15 last. It is apparent that the decline in some of the other commodities such as cotton and copper has gone about as far as it is likely to go, for the low level recently touched by both commodities was actually below the cost of production.

Industry Fighting Hard

The expense of converting raw materials into manufactured products is still greater than it should be and there is no doubt that it will be reduced, not because great corporations are trying to impose upon labor, but because industrial managers are fighting hard to make both ends meet. For this reason the developments in the labor market will be worth watching as the liquidation or reduction of wages is one of the most difficult, yet urgent, problems connected with the after war readjustment. The position of the railroads will be helped by the abandonment on July 1 of the national wage agreements as it is a great injustice to burden the public with higher operating charges, which means higher shipping charges, than the average traffic will bear. The Railroad Labor Board together with other government agencies may be depended upon to ascertain the exact facts and to deal justly with both the employers and the employed. There is reason to believe that an amicable settlement will be arrived at, for the situation is perfectly clear and the sensational decline in traffic emphasizes the folly of continuing wage scales and working hour agreements which make it possible for labor to consume more than 60 per cent of the gross incomes of the railroads.

Price readjustment in other lines is proceeding satisfactorily and manufacturers and merchants everywhere are operating cautiously, and trying to at least break even. In some lines this is a difficult task and there have been many instances where manufacturers and industrial managers have kept their plants in operation, not for the profit in the business at prevailing prices, but in order to give their operatives something to do. Federal, state and municipal officials are trying to start up road-building campaigns and other public enterprises so that the large unemployed classes might be given something to do and their families saved from suffering. Labor leaders in some cases have recognized these conditions and have advised the men to accept reduced pay without question. The unemployed problem is not as serious in all lines as it was a month ago and the hope is that with the resumption of spring work, it will be possible to launch more undertakings calling for the employment of a large number of idle men.

Spring Revival Here—National City Bank of New York

The general situation as to trade and industry has shown some further improvement during the past month, although the fundamental difficulty, which is the disruption of the price level between raw products and manufactured goods, is yet far from overcome. According to government reports, the level of the principal farm products declined 5.6 per cent in March, whereas the normal movement in March is upward, and over the last ten years has averaged 3.4 per cent. On April 1 the index figure of farm products was 58.3 per cent lower than a year ago, 48.6 per cent lower than two years ago and 27.6 per cent lower than the average on April 1 of the past ten years. Other primary products, such as lumber and the metals, as yet have made no recovery, while on the other hand manufactured products, especially at retail, freight charges and personal services generally, have made no corresponding decline. Naturally the sale of manufactures has fallen off, railway traffic has declined and there is a large amount of unemployment. A description of the situation is enough to explain it, for agricultural products and raw materials represent the purchasing power of about one-half the population.

Nevertheless, there is bound to be more doing in the spring than in midwinter, and the industries are going much better than they were three months ago. The automobile industry naturally is stimulated by spring and good weather, and has come back strong. The tire industry has revived, and one of the biggest tire companies, the Goodyear, which was in financial difficulties as a result of the sudden falling of business in the face of big inventories, has been successfully refinanced and started on its way. The tire industry is an important factor in the cotton-spinning industry, and the mills that are getting busy again on tire materials are no longer competing upon other cotton fabrics.

Iron and Steel

The iron and steel situation is quiet. with demand light, and no developments of importance since the United States Steel Corporation announced its reductions. The smaller producers are making practically no profit from present operations, and are not disposed to cut prices further at a time when they see little prospect of stimulating the demand. The big corporation is very deliberate in its policies, and especially desirous of avoiding criticism in its relations with labor. It is responsible for no wage reductions as yet, although with operations curtailed approximately one-half it is evident that wage payments are very much lower than they were. This, however, does not excite criticism like wage rate reductions, and the management probably is of the same opinion expressed by others, that price reductions at this time would not create new business. The reduction of prices in any one line usually seems to the people in that line to be not enough to change the general situation.

The Railroad Situation

The Railroad Labor Board made short work of the national wage agreements, after hearing the evidence. It dispensed with arguments and ordered the agreements abrogated as of July 1, next, directing that in the meantime agreements be negotiated between the individual roads and their employees. This is the action contended for by the railroad companies, with a view to attacking the burdensome classifications and other conditions which they inherited from Government control. A notable feature of the Board's decision was a draft of general principles which it laid down for the purpose of indicating to the contracting parties the conditions which the Board will require. They are generally regarded as excellent and if the Board is successful in establishing them as the standard of conduct in the operation of the railroads it will be one distinct achievement to the credit of the Esch-Cummins law.

A. S. M. E. Confers Honorary Membership

The American Society of Mechanical Engineers announced, on May 12, the election to honorary membership of Henry R. Towne, head of the Yale & Towne Manufacturing Co. and Nathaniel Greene Herreshoff, naval architect and yacht designer. The honor, which recognizes distinctive achievement in engineering and scientific endeavor, will be formally conferred at the next annual meeting.

Railroad Activities in Russia and Roumania

The Czecho-Slovakian paper *Vecer*, of Prague, publishes an interview with the Russian Railway Commissioner Lomansow, who has been in Prague for the last few weeks. According to this interview the Soviet government is about to place the following orders for locomotives: 300 each with Czecho-Slovakia, Switzerland and Italy, while 2,000 engines will be ordered in England, Germany, Denmark and Sweden, and 2,700 in the United States. Lomansow furthermore declared that the Soviet government will dispose of 2½ milliards in gold and jewelry to pay for the locomotive orders.

The Roumanian ministry of public works has just published a report, according to which 331 kilometers of new railways are now under construction in Greater Roumania, involving the expenditure of 100 million lei. The construction of other new lines will soon be started and the government has granted quite a number of concessions for private lines. The demand for all kinds of railway material is steadily increasing in the country.

An Appeal for Machine Tools from Korea

An unusual opportunity is offered to members of the machine-tool industry to come in contact with the future industrial leaders of Korea.

An established college is now installing a model machine shop for training efficient Korean young men in toolmaking and modern machine practice. These young men will be the future mechanical engineers and teachers in their land. This college is known as the "Chosen Christian College" and is operated by a board composed of members of nearly all of the missions working in Korea and is inter-denominational in its character.

This machine shop will give the Korean young men practical experience in a line of work with which they are only very slightly familiar and for which a rapidly growing demand is developing.

This is an exceptional opportunity to introduce high-grade American machine making tools to these young men and should result in opening Korea as a market to American manufacturers.

The headquarters of the college is at 150 Fifth Ave., New York City.

Indian Trade Notes

The *Indian Textile Journal* states that according to reports geological investigations have been made of the recently discovered iron ore deposits in the southern parts of Singhbum in the province of Behar. It is found that the ore occurs usually at or near the tops of the hills, the most important deposit being in the range running from about three miles southwest of Gua to the Kolhan-Keonjhar boundary east of Naogaon, a distance of about 10 miles. The applications made for prospecting licenses and mining leases have been numerous.

Figures given in *Finance and Commerce* show that 1,041 motor cars were imported into British India during September, 1920, of which 723 cars were from the United States and 247 from the United Kingdom. During the previous six months the number of cars imported was 7,948 valued at 308 lakhs (1 lakh equals 100,000) of rupees, compared with 2,553 cars valued at 74 lakhs of rupees in the corresponding period of 1919. Of these the United States sent 5,654, the United Kingdom 1,002, Canada 542, France 49, and Italy 43. Bombay imported 2,775 cars, Bengal 2,694, Madras 908, Land 590, and Burma 531.

Metal Trades in China

There are more than twenty machine shops in the city of Harbin. The smaller shops, which are in the majority, produce printing presses and flour milling machines, while the larger plants are equipped to build machinery of all kinds and several are connected with shipyards.

A large iron works, Shwang Hou Shen, is to be established near the Great River this spring. Many Chinese and foreign engineers have already been engaged for construction of the plant.

A large deposit of iron ore 11 miles from the Yangtze River in North China was recently investigated, with the result that it was found to contain about 4,000,000 tons of workable ore of high grade, and that conditions for working this deposit are generally satisfactory. Plans are now being prepared for the establishment of an ironworks at the port of Chinwangtao.

Steamship Operators Readjust Ocean Freight Rates

Ocean freight rates on commodities contingent to and moving through North Atlantic, South Atlantic and Gulf Coast ports were rearranged and readjusted at a recent conference of steamship operators held in Atlanta. The readjustment was brought about to obtain, through the adoption of new tariff schedules, an equitable distribution of products through the ports represented at the conference, as encouraged by the federal shipping act of 1920.

The rate agreement met with the unanimous approval of the operators present. It also accords to Southern ports competitive equities that have heretofore been denied them. It is understood that the South Atlantic and Gulf Coast ports were given everything they requested in the general readjustment.

Steamship operators attended the conference from the Northern ports of New York, Boston, Philadelphia, Baltimore and Norfolk, and from all of the South Atlantic and Gulf Coast ports.

Swiss Machinery Market Overstocked

Consul A. W. Donegan reports from Zurich, under date of Feb. 14, that local stocks of agricultural machinery and farm implements are claimed to be sufficiently large to cover the entire demand of Switzerland for years. The border warehouses, too, are stocked, and what sales are made from time to time are at very low prices.

Swiss manufacturers during the war increased their output considerably, as the warring countries, with the exception of the United States, were unable to export machinery of this type. Since the armistice the rate of exchange in Switzerland has been favorable to neighboring countries and has had the effect of overcrowding the Swiss market with farm machinery. Last year the imports from Germany alone were about three times the size of the imports from that country in normal years.

Swiss import figures for the first six months of 1920 give the total value of $898,825 for agricultural machinery and farm implements, while the United States is credited with $208,491 of this amount and Germany with $632,451.

Austrian Auto Builders to Merge

Austria's automobile industry is doing really much better than might be expected, in view of the general industrial depression throughout the country. This is largely due to the absence of foreign competition, since with the present low value of the crown it is next to impossible for American, British, French, Italian, or German manufacturers to sell their cars in Austria. A first-class German car would now cost more than twice as much as a similar car of Austrian make. At the same time the low value of their crown enables the Austrians to sell their products abroad at prices with which the home manufacturers in those countries cannot compete.

Taking advantage of these conditions, three of the largest Austrian automobile concerns, the Austrian Daimler, Austrian Fiat, and Puch Works in Gratz, are about to complete an amalgamation, the preliminaries for which were begun a long time ago.

Japanese Steel Merger

The combination of the six large private iron and steel companies in Japan is proposed by the government's financial and economic investigation committee as a remedy for the present financial difficulties of the industry of Japan. It is suggested that the government should give substantial aid to the combined companies, which would have an output about equal to that of the Wakamatsu State Steel Works, while these private factories and the government works together would control about 90 per cent of the country's total production.

Bellis Heat-Treating Demonstrated at Geometric Tool Co.

At the plant of the Geometric Tool Co., Blake and Valley Sts., New Haven, Conn., the Bellis equipment and process of heat-treating high-speed steel was demonstrated before the New Haven Chapter of the Steel Treaters Association and invited guests from the city and adjacent territory on the evening of Thursday, April 14.

The Bellis furnace is a rectangular structure with provision for three open crucibles, so constructed that only the central chamber and crucible need be fired after the furnace has reached working temperature. Gas is the fuel used, and the burners are arranged tangentially in a circular chamber so that the flame does not impinge upon the crucible.

The central chamber is connected by flues to the adjoining chambers on either side, so proportioned and controlled by dampers as to maintain correct relative temperatures in the secondary crucibles. Auxiliary burners in the supplementary chambers are used when starting with a cold furnace; to be shut off when the required temperatures have been established.

For hardening the standard high-speed steels a temperature of 2,200 deg. F. is maintained in the central crucible; approximately 1,400 deg. F. in the preheating crucible, and 1,100 deg. F. in the quenching crucible.

The high-heat crucible is composite, consisting of an outer shell of a special refractory material with a ¼-in. lining of steel. The other two crucibles are of steel, or may be of any other of the refractory alloys commonly used for this purpose. The heating medium used in the first two crucibles is a compound of salts patented by the Bellis Heat Treating Co., while the quenching medium, not being subjected to the extreme temperatures attained in the preheat and high-heat crucibles, is a compound of lower melting point. The features claimed for the Bellis compound are homogeneity, fluidity, and the ability to withstand high temperatures indefinitely without breaking down and forming compounds that will attack the steel.

The pieces upon which the demonstration was conducted were high-speed steel chasers of various sizes, the regular product of the Geometric Tool Co. Sets of two, four, or six of the chasers, according to size, were wired together and suspended in the molten compound contained in the first crucible, where they were allowed to remain for a period of three minutes. They were then transferred to the high-heat crucible for the same length of time and then immersed in the quenching compound.

The length of time the work remains in each bath is determined by the time required in the high heat crucible to make certain that each piece is uniformly heated to the temperature of the bath; and this time may vary somewhat according to the size and nature of the piece. The time of immersion in the other two baths is not so essential, beyond making certain that the work has reached the temperature of the bath before it is removed; but as a matter of convenience all the shifting from one bath to another is done at the same time; thus there is a fresh batch of work entering the preheating compound and one batch leaving the quenching bath at the expiration of each three-minute interval.

The work, though still red hot, is properly hardened when it leaves the quenching bath, and may be allowed to cool in air. It is, however, further cooled in oil to a degree that allows it to be handled, for the sake of expediting its progress through the hardening room.

After witnessing the demonstration, which was conducted in the regular hardening room of the plant, the party adjourned to the lecture room, where they were addressed by Major Bellis, the originator of the process. The speaker directed the attention of his audience to the benefits to be derived from the labors of large scale organizations; briefly outlined his connection with the research work carried on during the war by the United States Army in relation to the handling and heat-treating of high-speed steels, and told the results of tests that had been made of the various methods of heat-treatment.

He called attention also to the advantages of a liquid medium by means of which the heat would be rapidly and evenly conducted to all parts of the work without danger of overheating the corners or smaller sections; the difficulty of securing an even heat by the pack-hardening method, and the liability to oxidation and scaling attendant upon any method of heating in an open fire.

The Geometric Tool Co., through its president, Howard E. Adt, extended an invitation to the guests to submit their hardening problems for solution and to bring in samples of work with which they had experienced difficulty to be put through the process under the direction of the company's experts.

Machinery Used at Ford Sawmill

Machinery and other equipment which will eventually handle 100,000 ft. of timber a day is in process of installation at the Ford plant, Iron Mountain, Michigan. About 20 per cent of the complete equipment for the sawmill is already in place, consisting largely of live rolls, edgers, band mills and crimmers. Four 300-hp. Wick's boilers are being placed in position in the powerhouse east of the mill. A steam turbine capable of 750 hp. will furnish power for the huge mill saws.

A distinct feature of the mill is that every machine within it will be operated by an individual motor, with power furnished by the huge Wick's turbine. The mill will open about July 1.

Effect of Price Reduction on Steel Trade in South

That the new scale of reduced prices, announced recently by the United States Steel Corporation, will tend to make jobbers feel that they need hesitate no longer in placing their orders and that the new prices will have a sobering effect on the trade is the opinion expressed by prominent men of the iron, steel and metal trades industries in the Birmingham district. The steel price reductions are believed to be one of the best things that has happened for business in several months. No immediate purchasing movement is looked for because general conditions are not such that there is any great demand for steel products, but the jobbers will doubtless feel that the bottom has been reached and that they can now replenish their depleted stocks, with the virtual assurance that steel prices are now on a uniform and generally firm basis.

It is noted that steel mill operations are experiencing steady improvement in the Birmingham district. The Gulf States Steel Corporation is planning to relight its iron furnace at Gadsden on May 1, and will also resume operations in the open hearth furnace of the steel plant at Alabama City. The plate mill at the Fairfield works of the Tennessee Coal, Iron and Railroad Co. is operating double time, with enough orders in hand and being received to merit it. The bar mill of the Bessemer Rolling Mills and the rail and blooming mills at Ensley are operating steadily. About half of the open hearth steel mills in the district are now producing, while there are now five blast furnaces making basic iron at Ensley, one making ferromanganese, and one making foundry iron at Bessemer. This is considerable improvement in that regard and gives excellent promise of an early return to normal in this district. Within another week or two the car plant at Fairfield will also resume operations on a full-time schedule.

Mention of the name of George Gordon Crawford for the presidency of the United States Steel Corporation, to succeed James H. Farrell in the event the latter accepts the appointment tendered him some time ago by President Harding as chairman of the United States Shipping Board, has created considerable interest among men connected with the iron, steel and metal trades industries of the Birmingham district, for Mr. Crawford is well known in that section. He has been president of the Tennessee Coal, Iron and Railroad Co., of Birmingham, since 1908, and prior to that time was president of the National Tube Co., a subsidiary organization of the steel corporation. As a director of big affairs and a manufacturer Mr. Crawford has proven his ability in the excellent record he has made while in Birmingham. Men of the iron and steel industries throughout the country concede that he is well fitted for the presidency of the steel corporation.

French and Dutch Air Services Supplanting English Control of Air Lines in Europe

SPECIAL CORRESPONDENCE

Those interested in the development of commercial air-service in Great Britain are greatly perturbed over the adverse turn conditions have lately taken. In spite of British government assistance the air buses of continental Europe seem to be driving the English interests from the field.

Mr. Winston Churchill, Secretary of State for the British Colonies, has consented to retain temporarily the secretaryship of the air. Referring to this a writer in the *London Times* recently made statements which are significantly applicable to conditions in the United States. They are in part as follows:

"Were the Colonial Office a Ministry of Imperial affairs, there would be something to be said in favor of charging it with the development of British Aviation. *Our Empire requires aircraft even more urgently than any other power. We require it for defense, for linking our scattered commonwealth and for internal communications.* The small area of the British Islands may afford insufficient scope for aërial transport and our uncertain climate may be unpropitious, but Canada and Australia, Africa and India *present the wide spaces which give air craft full opportunity* while their climates are less subject to unpredicted changes. If the production of aircraft is not developed in Great Britain, our Dominions, Colonies and Crown Territories will get what they need from France, Germany or America. *Civil aviation is stagnating here.* The London terminus of commercial flying (which was to be the Charing Cross of the Air) is almost idle except for the visits of foreign competitors. There is a superficial attraction therefore in the idea that Mr. Winston Churchill with his constructive imagination and his restless energy should at the same time encourage the constituent parts of the Empire to demand aircraft and stimulate British manufacturers to supply the demand. *We have often urged it is the commercial application which must form the basis of swift and economical development, aircraft is not the least important of the three branches of the services. It must have behind it the full authority of a Minister of State who can concert measures for the defense of the country on equal terms with the Admiralty or War Office.*"

BRITAIN FALLING BEHIND

In support of the statement above regarding the comings and goings of "foreign competitors" at the London air terminus, the following will throw some light on the seriousness of this situation: "During the period from Feb. 7 to Feb. 13, 1921, there were 13 arrivals and departures from the official air-port at London to or from the continent with passengers, mails and merchandise. Of the thirteen machines, *five* were operated by the *Syndicat National pour l'etude des Transports Aeriens; five* by the *Massageries Aeriennes;* and *three* by the *Compagnie des Grands Express Aeriens.* Not one machine was operated by a British air-transport company."

During the war Great Britain performed wonders in her airplane development work but for some reason the advantage she then gained seems to be slipping from her. Immediately after the war the International Air Traffic Association was formed at a meeting at the Hague, with Major General Sir W. S. Brancker as chairman. It is a significant fact that this association, which at its inception was practically controlled by British interests, held its last meeting at Berlin

The British technical press, especially that branch of it which is intimately associated with aëronautics, is extremely pessimistic regarding the future of commercial air service in Great Britain. The Dutch and French are, however, preparing for a great boom in the industry during the coming season.

A VALUABLE TRAFFIC

Last year the French companies carried over 5,000 passengers and French air experts assert that this season the number of passengers will easily reach 20,000. The traffic is valuable and France is determined to carry it. Last year the French government spent $500,000 in the encouragement of commercial aviation. It is said that France is prepared this year to spend $2,000,000 for this purpose. Relying on government assistance the French commercial companies have cut the price of the Paris to London air trip to 300 f. (about 21 dollars). By making this cut the French expect to divert from the railways a large number of first-class passengers and it is reasonable to believe that they will.

The land and sea trip from London to Paris involves two train trips, viz., London to Dover, Boulogne to Paris, and one boat trip, Dover to Boulogne. If one takes into consideration the incidental expenses of these three trips (which are avoided by the air passage) under the new tariff it will be almost as cheap to travel by airplane as by land and sea. If time is of moment then all the advantage is in favor of the airway for by it there is a saving of about six hours.

The British air transport industry has been so hard hit by the recent hard times that even if an attempt is made to "buck" the French by cutting fares it is doubtful if the trade could be made to pay. The present British fare from London to Paris by air bus is £10 10s., say $40, if this is cut to £5 5s. (about $20) to meet the French tariff, and to it is added the British subsidy, the total amount received per passenger will amount to only a little over £6 10s., about $26.

The British air program for 1921 is badly disorganized. Orders for new and improved passenger aircraft have been cancelled. It is therefore considered impossible for the British air companies to handle sufficient volume of business to make a profit at the reduced price.

The French and Dutch made their plans last fall and have consistently adhered to and wherever possible improved them. It is therefore to be expected that they will be the nations who will most benefit from the coming air boom.

The Dutch are principally interested in the routes covering northern Europe.

Brill Co. Produces Gas Railway Engine

A gasoline-propelled passenger coach and trailer for use on steam or electric railroads, which eventually may revolutionize city and interurban passenger transportation, has been completed by the J. G. Brill Co., Philadelphia, Pa.

It is a development of an idea on which railway and motor engineers have been working in recent years. One point in this effort has been to get a simpler and less expensive means of transportation.

The government has become a sponsor for this new type of passenger vehicle. This Philadelphia car will be shipped to Camp Allen A. Humphreys, at Belvoir, Va., where the government will put it in use in place of steam equipment. Army engineers in Philadelphia on orders from Washington have inspected and approved the car. Its performance on the camp railway will be closely watched by railway leaders as well as the government representatives.

Circular on Physical Properties of Materials

Circular No. 101, issued by the Bureau of Standards, aims to present in readily accessible form the best available data on the strength and related properties of materials. Among those treated are iron, carbon steel, alloy steels, wire and wire rope, semi-steel, aluminum, copper, miscellaneous metals and other alloys, rope, rubber, leather, and wood. The tensile strength, proportional limit, percentage elongation in 2 in., percentage reduction of area, Brinell and scleroscope hardness corresponding to a certain composition, density, and method of preparation are shown in most cases for the metals and alloys. In addition, figures are given in many instances for the compressive and shearing strengths, moduli of rupture, and Erichsen values. The circular also includes definitions of the properties treated and references to sources.

Wallace Speaks Before Milwaukee Engineers

Condemning the "eternal triangle" which makes up the daily schedule of the average workshop as deadly to industry, and commending the doctrines of Theodore Roosevelt as a safe guide for the nation's industrial leaders, L. W. Wallace, executive secretary of the American Engineering Council of the Federated American Engineering Societies, declared that the most important task of capital was to give the economic facts governing world industry to the masses of industrial workers.

Addressing the conference of the Society of Industrial Engineers, at Milwaukee, Wis., on April 27, Mr. Wallace asserted that industry of every kind was saddled with enormous waste and that more co-operation and less competition was a vital national need. Mr. Wallace pledged the support of the new engineering federation, which is pushing its organization into every industrial center of the country, to Congress in the work of government reorganization.

He called upon the legislators not to be disturbed by propaganda in behalf of those who will lose their jobs when business principles prevail in Washington, saying that to bring about a reorganization that will mean most to the nation will require the application of the Rooseveltian principles of honesty, courage and common sense. Impossible conditions prevail in the conduct of the public business, said Mr. Wallace, citing Secretary Hoover's statement of absurdities which exist in the Department of Commerce. Mr. Wallace added:

"Today as never before in the history of industry there is a necessity for candor and absolute honesty. More information and less hearsay is the need of the hour. We can conceive of no more important task for the industrial leader to perform than just this: Give the economic facts governing world industry to the masses of industrial workers.

"With such a background formed, then take them into your confidence as regards your business. Show them the books of the company, inform them of the financial condition of the company and as to the probable business for the year. If this be done much hearsay and the restlessness and disturbance resulting therefrom will be eradicated.

"The industrial leader needs to be more than purely an industrialist, just as Herbert Hoover, an engineer, is more than purely an engineer. Unfortunately the daily schedule of too many industrial leaders reads as follows: Home to plant—plant to lunch—lunch to plant—plant to home. An eternal triangle, almost as deadening as that other eternal triangle that we so frequently hear of. The industrial leader, by virtue of the fact that he has within his control the destinies of hundreds or thousands of workers and their families has a peculiarly significant responsibility to meet as a citizen. He cannot shut his eyes to the condition of the schools, of the streets, of the public utilities of the community in which his workers reside. If he fails to make his executive ability felt in all matters of community concern then he has failed to meet his responsibility as an industrial leader."

Mr. Wallace said that the national assay of waste being conducted by American Engineering Council had demonstrated the necessity of standardization of production and that new policies of distribution must be adopted if costs were to be lowered and normalcy attained.

How Dusty Is Your Plant?

All industrial plants are dusty. But how dusty is the air in any particular plant? Knowledge as to the degree and composition of such dust is important, for certain amounts and sorts of air dust seriously affect the lungs and predispose those who breathe them to tuberculosis and other diseases.

Dr. O. M. Spencer, of the U. S. Public Health Service, discusses the matter in a recent report of the Service. He shows that neither the fact that the exhaust pipes, etc., required by law appear to be properly functioning nor the use of wet instead of dry processes in grinding, polishing, and the like make it at all certain that the dustiness in a given plant is what it should theoretically be. He finds that many exhaust pipes do not in fact exhaust as they are supposed to do; and that under certain conditions some wet processes create much more dust than dry ones. Only actual "dust counts" show the real dustiness of the air that the workmen must breathe; and such counts should be made periodically to check the theoretical conditions.

To determine how unhealthful the dustiness of any particular plant process may be the composition of its dust should be ascertained and its effects interpreted by standard tables, which Dr. Spencer urges should be worked out for the various industries. Different industrial processes produce dusts which differ greatly in injurious properties.

To Organize Association of Employees' Clubs

On May 25 a conference will be held in New York City to effect organization of an association of the employees' clubs of America. Active membership will consist of clubs, associations or societies of employees of industrial, financial, mercantile or other organizations, having for their main purposes social, athletic, educational, thrift and savings, health, safety or other similar mutual benefit activities; companies having "clubs" holding active membership will be associate members.

Plans for the organization have been under way for several months by a temporary committee with headquarters on the 22d floor, Times Building, New York City.

Steel Industry Operating at 40 Per Cent Capacity

The feature of the iron and steel industry during the month is of course, the 20 per cent reduction in wages announced by the United States Steel Corporation, effective May 16. The immediate result of this reduction has been to arouse hope in the breast of the consumer that lower prices would follow. As far as the corporation is concerned, it has been figured out that the cut in wages did not offset the reduction in prices of April 13. Last year the labor cost alone on each ton of steel sold by the leading interest amounted to $40.80, as against $15.03 a ton in 1915, and the recent cut will bring the labor cost to about $32.64, which is still more than 100 per cent greater than the pre-war figure. The independents have been struggling along at prices which show little or no profit, anticipating that a revival in buying and consequent increase in operations would increase the profit and enable them to maintain the present price schedule and labor wage level. There is no prospect of an early buying movement, however, and there is a growing conviction that the independents contemplate a further reduction in wages so as to accomplish a lower price level. The wage reduction by the corporation is most severely felt in and around Pittsburgh as a great number of the mills of the leading interest are situated in this district. Union leaders and representatives of the independent steel interests will meet in Atlantic City late in the month to confer over the wage agreement.

The operations of the steel mills throughout the country are estimated at approximately 35 or possibly 40 per cent of capacity. This week, as was the case during the two preceding weeks, the increased demand for steel sheets, bars, etc., from the automobile manufacturers has been the bright spot in the market. There is a surprisingly small amount of price cutting from the level lately established by the independents and the corporation and virtually none by the larger independent interests. There is some shading being done by the steel warehouse interests, and jobbers in different parts of the country, and the fact has been brought out lately that not all of the surplus stocks bought at high prices during the boom times last year have been liquidated.

The daily pig iron output is down to the lowest level it has touched since the year 1908, and the April production amounted to only 1,193,041, as compared with 1,595,522 tons in March. Fifteen furnaces were either banked or blown out during April, and but nine blown in, and the month of May started with but 96 furnaces producing, as against 319 Oct. 1, 1920. W. P. Snyder & Co. estimates the average price for basic iron during April at $22.50, as against $24.50 in March, and that of bessemer at $25, as compared with $26.20 during March.

Business Conditions in Germany

By Our Berlin Correspondent

The decline of business is still progressing. In fact the political crisis, initiated by the London conference, is taking effect in business life only by degrees, and a further aggravation of the situation must be expected. The slight revival of demand, stimulated by efforts to obtain supplies before the sanctions and the customs barrier in the Rhineland came into effect, has subsided. Business between England, France and Belgium on the one hand, and Germany on the other, has come to a complete standstill.

On the other hand, the supply of raw material for the machine building industry has further improved. It appears that the production of the steel works during the last months widely exceeded the demand, and that the works are overstocked. The steel mills are now from 50 to 70 per cent working for stock. Their situation is rather serious, it being reported that many large orders have been suspended, and very few new orders received. This is ascribed to the expected reduction of prices, but is obviously due to a large extent to the general business depression. Nearly all mills are, in defiance of the price convention, selling below the official prices without being able to stimulate the market. The extent of current underbidding can be seen from the following figures:

	Official Prices of Iron Society	Actual Market Prices per Ton
Bars	M2,440	M2,000
Sections	2,340	2,100
Plates	3,000	2,700
Sheets	3,360 to 3,775	2,800
Wire	2,720	2,300

The prices of bars were, in May, 1920, M5,800 per metric ton, and the drop since then is, therefore, more than 60 per cent. More important still to the machine building industry is the decline in the prices of castings. These prices have lately been fixed as follows:

Castings from	Marks
2 to 10 lb.	2.80 to 3.60 per lb.
20 to 100 lb.	2.40 to 2.60 per lb.
200 to 1,000 lb.	2.20 to 2.35 per lb.
1,000 to 2,000 lb.	2.10 per lb.
2,000 to 6,000 lb.	2.07 per lb.
Over 6,000 lb.	2.00 per lb.

These prices are, however, purely nominal, the works having received permission to give discounts up to 40 per cent in order to meet the present market conditions.

Such reductions are affording the machine building industry some relief, especially as a decrease of wages cannot be expected, and their maintenance at the present level is all that can be hoped for. They are, however, only of a temporary character, and it is very doubtful whether the lower prices will last out to a period of brisk business, when the machine building industry could really enjoy them. Moreover, they are largely counteracted by the general increase of freight rates, which in the case of coal and raw material amounts to 65 per cent. In the case of factories removed from the coal and iron districts, the increased freight charges more than balance the present or any possible future decrease of prices.

The degree of the employment of the machine building industry in the various branches still shows the same variations. To the most favored branches—the locomotive and railroad car industry—has lately been added the shipbuilding industry, large orders having been placed, or are being placed, on the strength of the huge indemnity awarded the shipping concerns. The locomotive and car factories have in hand very voluminous orders amounting to M2,830,000,000 from the German State Railroads for 900 locomotives, 1,344 passenger cars, and over 12,000 trucks. Besides these orders, large orders have come from abroad for locomotives and cars. The employment of the agricultural machinery industry has remained stationary. With these sole exceptions, a continuous decline of business is noticeable in all other lines.

The large aeronautical industry of the country, which has tried to find employment in other lines, has so far had very little success in this direction, and is in a most distressing state, most works having been shut down.

The electrical industry, which entered into the current year with great expectations for large orders from electrification schemes, and has made preparations for increased output, laying in huge supplies of foreign copper and other material, and making provisions for increased manufacturing space, has so far been entirely disappointed. The extensive program of hydro-electric and other power plants, which for a long time had the interest not only of the electrical industry, but of the whole population, has been withdrawn for the time being, evidently due to the changed aspect of the world's coal situation. This not only applies to Germany, but also to surrounding countries, like Switzerland and Sweden, where the enthusiasm for electrification also has cooled down completely. The German electrical industry, which was figuring on having a share in foreign electric developments, appears therefore to be balked in this direction also.

The only branch of the industry which so far enjoys fairly good employment is the telephone and telegraph.

In the machine-tool industry, the decline has assumed larger proportions than ever before since the London conference. Only small factories making specialties are adequately employed. The main business in hand is mostly for railroad cars and locomotive factories. The shipbuilding industry has so far withheld large orders, and none are expected to be forthcoming, as the existing plant is more than adequate for all present requirements. The factories in the occupied Rhineland have practically come to a standstill. Their situation is a very precarious one indeed, as they find themselves locked in entirely on all sides, and separated from their markets. The limited market left them within the narrow confines of the present customs barriers is of course insufficient to support these industries.

As the manufacturers in this district are confronted by higher cost of raw material also, and by a possible rise of wages, caused by increased living expenses due to the isolation from the interior of Germany, it is difficult to see how they will be able to compete with their rivals across the customs frontier. The views in this respect are exceedingly gloomy. Alfred H. Schütte, of Cologne, has shipped the greater part of its stock to the Berlin branch, and has left only samples of each type of machinery at headquarters. This is significant of the expectations entertained in these parts. Schütte's shops are now working only four days a week, with a reduced number of workmen. They present, however, rather a picture of desolation, on account of the small amount of machinery now in operation.

In consequence of this situation, prices are weakening along the whole line, and the elaborate organization which the machine-tool industry has established for the maintenance of standard prices, seems tottering. This organization comprises committees formed out of manufacturers of the various types of machinery, which are an integral part of the Machine Tool Builders' Association. The committees lay down rules for minimum prices, which have, during times of good business, very often been exceeded, sometimes by more than 100 per cent, but are now silently disregarded. Discounts are being given of from 15 to 30 per cent of the prevailing standards. The following figures, representing the prices of the Lathes Convention, demonstrate the movement since last year. For a lathe of the most up-to-date type with single pulley drive and change gear box, the following minimum prices have been, or are now, in force:

	Jan., 1920	May, 1920	Present Prices
16″ x 3½′, weight 1,400 kg.	M 28,000	46,000	32,000
18″ x 3½′, weight 1,700 kg.	35,000	57,000	40,000
22″ x 3½′, weight 2,600 kg.	45,000	75,000	57,000
27″ x 3½′, weight 3,900 kg.	62,000	102,000	72,000

It should be noted that the prices reached their culmination point in May

of last year. Shapers of modern type registered the following prices:

	May-August, 1920	Present Prices
16-in. shapers..	M 25,000	M 22,000
20-in. shapers..	29,000	25,000
24-in. shapers..	36,000	27,500
MILLING MACHINE		
28" x 7", weight 800 kg..	M 21,000	M 18,000
UNIVERSAL MILLING MACHINES		
30" x 9", weight 1,000 kg.	M 44,000	M 36,000

Ten per cent discount is being given to the trade, and for export trade, 10 per cent, as a rule, is added. Numerous cuts in quotations are, however, now becoming quite the rule, as the control of export prices has considerably relaxed. A movement is now on foot to discard the whole organization for the adjustment of prices, manufacturers desiring a free hand. The export control will be maintained only nominally, to interfere solely in the case of ruinous underbidding.

As the majority of manufacturers are now mostly working for stock, and the latter is accumulating at an alarming rate, the production will have to be reduced, unless an outlet can be found for the industry. According to authentic information, the present convention prices contain—in the case of well-equipped factories—a net profit of 25 per cent. This percentage represents the limit to which manufacturers can go in reducing their prices without actually selling below cost. The actual practice in quotations has already arrived at this limit without any material results as to improvement of business, which seems to prove that against all theories it is not solely the price question which is at the root of the present business crisis.

Business Items

The Victor Tool Co., of Waynesboro, Pa., has opened a branch office in New York City, located at 131 West 39th St. F. W. Curtis is manager and W. J. Boe, sales engineer. All matters pertaining to the New York territory will be handled at this office.

The Philadelphia Gear Works, Inc., 1120-1128 Pine St., Philadelphia, Pa., has opened a new factory to be known as Plant No. 2, which is expected to be in full operation in a few weeks. The plant is equipped with a 15-ton electric crane, enlarged railroad facilities and much additional floor space. A full complement of modern machinery has been installed.

The Hamilton Car Co., Ltd., of Hamilton, Ont., Can., has been organized for the purpose of carrying on the business heretofore conducted under the name of the National Steel Car Corporation.

The Tinius Olsen Testing Machine Co., 500 North 12th St., Philadelphia, Pa., has taken over the manufacture of balancing machines formerly made by the Carlson-Wenstrom Co. and the Lippincott-Carwen Co. of that city.

The Cadillac Tool Co., Detroit, Mich., announces the removal of its machine-tool sales division to the new quarters at 38 Hendrie St., Detroit.

The Air Reduction Sales Co., manufacturer of Airco oxygen, acetylene and welding and cutting apparatus, will move its executive offices to 342 Madison Ave., New York City. It is also announced that the district office will now be located at 191 Pacific Ave., Jersey City, N. J.

The Simpson-Peck Manufacturing Co., of New Haven, Conn., was recently organized and incorporated with a capital stock of $50,000 to engage in the manufacture of tools, hardware, etc. The incorporators are W. A. Peck and A. A. Twitchell, of New Haven, and W. H. Simpson, of New York City.

The Buckeye Machine Shop, Canton, Ohio, has added an engineering department, in charge of A. B. Wiser, who until recently was production manager of the Union Metal Manufacturing Co. Increasing business made the addition expedient.

The Lee Manufacturing Co., of New Haven, Conn., has recently been organized to manufacture machinery, machines, tools, etc. The capital stock of the new company is $25,000, and the incorporators are Robert E. Hyman, C. L. Buslee, and Attorney Michael J. Quinn, all of New Haven, Conn.

The Cowan Truck Co. has moved its Chicago office from the Fisher Building to 659 West Lake St. In the new location they will open a store and carry a stock of various products. The office will be under the management of T. S. MacEwan.

Announcement has just been received of the removal of Establissments Moerch & Roumet from 120 Boulevard Richard Lenoir, Paris, France, to a building recently constructed at 47 rue de Cambrai, Paris. This building will provide 3,250 sq.ft. of floor space and considerable show window facilities, making it one of the most magnificent machine-tool display buildings in France. The firm also announces that in view of the increased import tariff on German made machine tools, recently imposed by the French government, a greater volume of business with American firms will be possible. Moerch & Roumet is the representative of several American machine tool builders. L. S. Devos, Grand Central Palace, New York City, is the American representative of Moerch & Roumet. E. Bonnamy is the technical director.

The Cincinnati Grinder Co. has recently placed the sale of its line of grinding machines on an exclusive basis with the Marshall & Huschart Machinery Co., in the Chicago district; Motch & Merryweather Machinery Co., in the Cleveland, Cincinnati, Pittsburgh and Detroit district; Henry Prentiss & Co. in the New York and New England district, and will also maintain its own grinding specialists in the respective territories.

Personals

GORDON AHLGREN, connected with the Buettner & Shelburne Machine Co., at Terre Haute, Ind., is making a vigorous fight for the nomination on the republican ticket as councilman from the first ward of his city.

ELWOOD HAYNES, of Kokomo, Ind., was elected a member of the board of directors of the Stevenson Gear Manufacturing Co., Indianapolis, at the annual meeting of the stockholders held there recently. Members of the board who were re-elected follow: G. E. Stevenson, G. R. Stevenson, E. C. Jones, of Indianapolis, T. J. Stevenson, of Anderson; Simeon McQuiston, of Kokomo, and R. T. Wingo, of Detroit. The directors decided at the meeting to build a subsidiary plant at Detroit. The company has perfected a machine for multiple gear cutting, by which all the gears on any given piece may be cut at once.

JOHN MCKAY, assistant superintendent of the McDonald mills of the Carnegie Steel Co., Youngstown, Ohio, tendered his resignation on May 1. His successor has not yet been named. Mr. McKay came to McDonald more than a year ago, after fifteen years' experience as a superintendent of the Carnegie plant in Greenville, Pa. He will return to Greenville where he will retire from active service.

E. D. SHEARMAN, one of the founders of the Salisbury Wheel and Axle Co., Jamestown, N. Y., and its general manager until the company was sold in 1919, has been elected secretary and a director of the Collier Motor Truck Co., Bellevue, Ohio.

C. F. HERRINGTON, who for the past five years has been identified with the Bonnot Co. of Canton, Ohio, as mechanical engineer and district sales manager in Chicago, Ill., resigned on May 1 to accept a position as vice-president of the Holbeck Engineering Co., Cleveland, Ohio.

A. L. DELEEUW, consulting engineer, has moved his offices from the Singer Building to 30 Church St., New York, N. Y.

C. EARLE SMITH of the National Twist Drill & Tool Co., Detroit, Mich., has recently been elected a member of the board of directors and is now secretary and sales manager of the firm.

Erratum

We regret that due to an error in our issue of May 12 the following personal was inserted in the obituary column instead of in the Personals column:

JOHN A. BAKER, formerly connected with the Mesta Machine Co. of Pittsburgh as assistant general superintendent, has been appointed works manager for the Los Angeles plant of the Rich Steel Products Co.

Washington Notes

By Paul Wooton
Washington Correspondent

Congress and the Army, as well as the Navy, are face to face with the problem of what shall constitute an adequate reserve of material. While such a reserve applies to a limited extent to quartermaster stores and explosives, the main problem is the maintenance of adequate supplies of artillery, rifles, machine guns, shell and other ordnance material. Involved in this question also is the matter of inducing machine shops and other industrial establishments to make preparation for prompt conversion for the manufacture of munitions. It carries with it also the necessity of training machinists and other workers in the specific tasks required in the manufacture of war machinery and other equipment.

Ordnance officials are a unit in the opinion that steps should be taken to maintain a reserve of material. Just at this time, as a heritage from the late war, there are ample supplies of practically all types of munitions. Depreciation, of course, takes place at a rapid rate. The hope is that a replacement fund can be established to take care of this depreciation on an annual basis, thus providing for its renewal without waiting until the whole reserve must be replaced at a formidable expense. Representative Kahn, of California, who is chairman of the Committee on Military Affairs of the House of Representatives, has favored ever since he has been a member of Congress—Nearly 22 years—the appropriation of $50,000,000 annually for a preparedness fund.

Dollar-a-Year Insurance

In a recent address before the officers of the Chemical Warfare Service, Mr. Kahn pointed out that the $25,000,000,000 expended by the United States during the World War would have provided annual payments of $50,000,000 for more than 400 years. Had the American people demanded a preparedness fund of $50,000,000 each year, the saving during the recent war would have been several billion dollars, Mr. Kahn declared. The question now is, will the American people expend $1 per capita per year for a preparedness fund? It is pointed out that such insurance could be bought by the sacrifice of a picture show or a few soft drinks per year. It may be said, however, that there is grave doubt, both among the lawmakers and among Army officers, as to whether the needless losses of the recent war have constituted a sufficient lesson to the public to cause them to demand the appropriation for some such replacement fund. Such a policy would follow that of any well regulated manufacturing plant which builds up each year a replacement fund to take care of renewals.

Despite the feeling that there will be much opposition to the creation of any such annual preparedness fund, an effort will be made to put such an appropriation through Congress. If the effort is successful, the idea is to distribute, as widely as possible, the contracts for guns, shell and other equipment, so that industrial plants may become familiar with this type of work and that the necessary skilled personnel among workmen may be built up. This applies particularly to that part of work on ordnance material, which is the product of machine shops.

Want Mobile Machine Shops

That the mobile machine shops built during the war for the ordnance department are much in demand is indicated by the strenuous efforts being made by the state highway departments to secure some of these units for use in connection with the upkeep of their highway automotive fleets. The War Department is particularly anxious not to give up that type of equipment. Several unsuccessful efforts were made during the last session of Congress to pass legislation directing the Secretary of War to turn over several hundred of these mobile machine shops to the Department of Agriculture for distribution among the several states. Bills again have been introduced at this session providing for such transfer, with the prospects somewhat brighter for their enactment into law.

New Publications

Pyrometric Practice. Technologic Paper No. 170. By Paul D. Foote, C. O. Fairchild and T. R. Harrison, all of the Bureau. Paper covers, 326 pages, 7 x 10 in., 185 illustrations. Published by the Bureau of Standards, Department of Commerce, Washington, D. C.

This volume is a complete treatise of the practical phases and applications of pyrometry, as well as its theory. All general methods of measurement, instruments, use and standardization of pyrometric apparatus are discussed. The paper is illustrated with diagrams and photographs of modern American instruments. Many tables of data are included and the treatise contains an index for ready reference. The volume is quite comprehensive and should serve as an admirable reference book. The principle divisions of the book are: high temperature thermometry, thermo-electric pyrometry, optical pyrometry, radiation pyrometry, resistance thermometry, recording pyrometry, high-temperature control, melting-point methods at high temperatures, standardization of pyrometers and industrial applications of pyrometry.

Descriptive Geometry Problems. By F. G. Higbee, M. E. professor and head of the Department of Descriptive Geometry and Drawing, University of Iowa. Cloth covers, 12 x 9 in., 77 plates, 218 problems. Published by John Wiley & Son, Inc., New York, N. Y.

The book contains only problems and is intended to be used as a supplement to any standard text on descriptive geometry. The problems are well selected to cover the general and special cases, and they provide considerable variety, although dealing with the fundamental principles of the subject.

The arrangement is such that only one proposition appears on a page, although several problems are usually shown on each. The pages can be removed from the book because of the type of binding used. This enables them to be posted up for the use of the students and prevents the assumption of an incorrect problem. The solutions to the problems in practically all cases do not extend beyond the sheets. The paper used will permit of inking.

Electric Welding. By Ethan Viall, formerly Editor *American Machinist*. Four hundred and seventeen 6 x 9-in. pages; three hundred and twenty-nine illustrations and thirty-one tables. Published by the McGraw-Hill Book Co., Inc., 370 Seventh Ave., New York City.

This book is a pioneer of its class and thoroughly deals with the subject of electric welding. It covers a wide range; from the use of the two known types of welding electrodes, through the gamut to the physical properties and metallography of arc-fused steel, automatic arc-, butt- and spot-welding. Nearly every class and make of welding machine is described and illustrated. Some of the chapters are: The History of Electric Welding; Arc Welding Equipment; Training Arc Welders; Carbon Electrode Welding and Cutting; Arc Welding Terms and Symbols; Physical Properties of Arc-Fused Steel; Automatic Arc Welding; Electric Welding High-Speed Steel and Stellite; The Strength of Welds.

The book covers the subject well and a copy should be in the hands of every shop executive.

Turret Lathe Practice. By Joseph G. Horner, A. M. I. Mech. E. Two hundred seventy-six 5 x 8-in. pages; 246 line drawings. Published by Emmott & Co., Ltd., 65 King St., Manchester, England.

A comprehensive treatise devoted to the turret lathe and its use, written in a clear, concise manner which, while dealing with practically every phase and problem of turret lathe operation, especially recommends itself to the practical shopman. The book contains descriptions of both machines and tools, illustrated with line drawings, including tools for various operations as recommended by both American and English engineers and tool designers.

Chapter headings are: Introduction (The Turret Lathe); Turning and Allied Operations; Drilling; Reaming; Boring and Allied Operations; Screw-Cutting; Work Done From the Cross-Slide; Examples of Tool Equipments; Capstan and Turret Details; The Headstocks; Collet Chucks and Wire Feeds. The contents are well arranged, and the material is handled in a manner that indicates a thorough knowledge of the subject.

Gas Torch and Thermit Welding. By Ethan Viall, formerly Editor *American Machinist*. Four hundred and forty-two 6 x 9-in. pages; three hundred and forty-two illustrations and twenty-four tables. Published by the McGraw-Hill Book Co., Inc., 370 Seventh Ave., New York City.

This book thoroughly discusses all phases of welding practice by both the gas torch and the use of thermit. A description is given of nearly all the ordinary types of welds, and practically every type of gas torch of American manufacture is described and illustrated. Among the chapters are: The History and Uses of the Gas Torch; The Production of Gases Used in Welding; Medium and Low Pressure Generators; Pressure Regulators; Making Allowances For Expansion and Contraction; Welding the Various Metals and the Fluxes Used; Welding Jigs and Fixtures; Welding Machines; Thermit Welding; History, Nature and Uses of Thermit; Plastic Process Welds; Fusion Welds of Heavy Sections.

The author appears to have covered about all that is known of the subject, and welders and those having to do with welding and cutting will find this book a veritable encyclopedia of information.

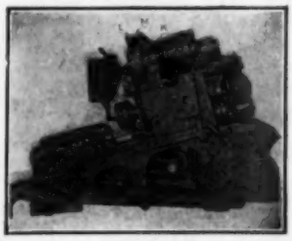
National Electrical Safety Code: Handbook No. 3, Bureau of Standards, Department of Commerce, Washington, D. C. Third edition, 366 pp., 5 x 7½ in., buckram covers. Obtainable from Superintendent of Documents, Government Printing Office, Washington, D. C.

The National Electrical Safety Code has been developed with the co-operation of representatives of all branches of the industry, and the previous edition has become widely known as Circular No. 54. The rules have been adopted in whole or in part by a number of state commissions, and they constitute a recognized standard for the prevention of accidents in the electrical industry. The code consists of four main parts dealing, respectively, with (1) the installation and maintenance of electrical supply stations and sub-stations; (2) the installation and maintenance of overhead and underground supply and signal lines; (3) the installation and maintenance of utilization equipment; (4) rules for the operation of equipment and lines; and supplementary sections which include rules for protective grounding of equipment and circuits.

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Lathe, Automatic, Inclined-Bed, Hartness
Jones & Lamson Machine Co., Springfield, Vt.
"American Machinist," Feb. 17, 1921



The machine is intended for production work on the turning of pieces that can be held in a chuck. The motor is mounted in the base, and drives to the change-gear box at the left by means of a silent chain. The head is driven from the gear box through flexible connections. The work is held in a chuck placed over the dumping chip pan at the right. Because of the inclination of the machine the work rests in the proper position in the chuck while tightening. Two sets of tools are carried on round bars, one above and one below the spindle. These bars move endwise for axial feed and turn in order to secure the proper depth of cut, to face or crossfeed, and to present new tools to the work. One large cam drum at the top of the machine controls all of the movements. The tool-carrying heads can be readily removed without disturbing the set up.

Shear, Slitting, Steel, Bench, Chicago
Dries & Krump Manufacturing Co., 2917 South Halsted St., Chicago, Ill.
"American Machinist," March 3, 1921

The shear is intended for use in machine shops, tin and sheet-metal shops, garages and factories. It will cut steel bars up to $\frac{1}{2}$ x 2 in. and will slit steel sheets up to No. 10 gage. The shear weighs 22 lb., the light weight being made possible by an all-steel construction. The frame is pressed from a steel section, and is offset in order to allow sheets of any length to be slit. An adjustable hold-down is provided to keep the material from bending up while being cut. The leverage is obtained by means of a geared lever, the teeth of which mesh with those on the frame. The frame is 9 in. long and 6 in. high. The upper blade is 6$\frac{3}{4}$ in. long x $\frac{3}{4}$ in. thick, and the lower blade is 4$\frac{1}{2}$ in. long x $\frac{1}{2}$ in. thick. The blades are made of crucible steel. The handle is made of pipe and is shrunk onto the casting forming the gear.

Indicator, Test, Lathe
M. B. Hill, 10 Eden St., Worcester, Mass.
"American Machinist," March 3, 1921

The indicator is attached to the shank by a universal joint, so that when in the lathe it may be turned to any angle. Two sensitive points are provided, one of which may be removed by unscrewing the sleeve without interfering with the action of the other. A rabbetted slide covers the amplification movement, allowing easy access for repair or readjustment. A similar device, not attached to a shank, is made for general use.

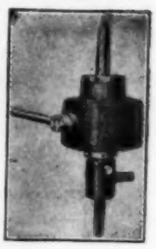
Chamfering and Threading Machine, Opposed-Spindle, Automatic, No. 183
Grant Manufacturing and Machine Co., Bridgeport, Conn.
"American Machinist," March 10, 1921

The principal parts of the machine are two cutter spindles, the magazine, and the work-holding and feeding table. The spindle bushings have a lateral adjustment of approximately 2 in., and are fed to the work by levers situated below them and operated by face cams within the body of the machine. The automatic movements are controlled by a small hand lever at the front of the machine, the operating mechanism being located at the rear. The work is placed in the inclined hopper, from which it is fed, clamped, machined and ejected automatically. With slight modification the machine can be adapted for threading both ends of small rods automatically, or for drilling, counterboring or countersinking.

Truck, Warehouse, Self-Loading
Lewis-Shepard Co., 568 E. First St., Boston 27, Mass.
"American Machinist," March 3, 1921

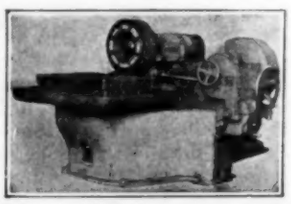
The truck is made in two sizes. It is of all-metal construction, and is equipped with Hyatt roller bearings. It can be handled by one man. The hook is adjustable in two directions and may be placed in ten positions vertically and twenty-eight horizontally. It has no interfering projection back of the truck. It is stated that the handles are of such shape that the truck can be easily controlled. Specifications: Model A. Capacity, 800 lb. Extreme width, 23 in. Overall length, 57 in. Wheels, 8 x 2$\frac{1}{2}$ in. Weight 72 lb. Model B. Capacity, 1,200 lb. Extreme width, 23 in. Overall length, 63 in. Wheels, 8 x 2$\frac{1}{2}$ in. Weight, 76 lb.

Chuck, Tapping, Reversing
John Chuck Co., Milwaukee, Wis.
"American Machinist," March 3, 1921



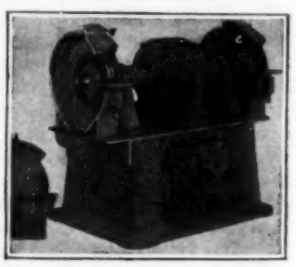
The chuck drives the tap by means of a device driving equally on each side of the tap shank. It is equipped with a five-point, positive clutch. It is stated that the clutch is capable of disengaging within a limit of 0.001 in. when the tap reaches the predetermined depth. It has a balanced drive concentric with the spindle, reversing with a two-to-one speed ratio. The gears all run in oil. The chuck is provided with an oiling device to give a copious flow of oil directly on the tap and work. The device is adaptable to any drilling machine, no special counterweight being required on the drilling machine spindle. It is stated that, owing to the construction, the sensitive clutch and the oiling device, the life of taps is greatly prolonged and breakage is reduced. Made in three sizes: No. 1, 0 to $\frac{3}{8}$ in.; No. 2, 0 to $\frac{5}{8}$ in.; No. 3, $\frac{1}{4}$ to 1 in. Equipped with Morse taper shanks. Aluminum body. All wearing parts hardened alloy steel.

Grinding Machine, Surface, Oscillating, Lumsden, No. 86
Alfred Herbert, Ltd., Coventry, England, and 50 Church St., New York, N. Y.
"American Machinist," March 10, 1921



The machine is especially adapted to locomotive, ship-building and general engineering shops, where products such as steel railway buffers, axle boxes and covers, and similar parts having plane surfaces require grinding. It is stated that the output is rapid, surfaces up to 24 x 10 in. being handled. The grinding wheel is mounted on an arm that can be swung about the center of the driving shaft. The grinding-wheel head consists of a 16-in. segmental cupped wheel, mounted on a ball-bearing spindle carried in a ram which has an adjustment parallel with the axis of the spindle. There are three speeds of oscillation of the wheel. An ample supply of water can be provided by a pump driven from the countershaft. Horsepower required, 20. Floor space, 9 ft. 6 in. x 6 ft. 9 in. Approximate net weight, 8,100 lb.

Grinding Machine, Floor, Motor-Driven, No. 18
Marschke Manufacturing Co., Indianapolis, Ind.
"American Machinist," March 10, 1921



The machine is designed for heavy duty and the arbor is mounted on four Hess-Bright ball bearings. The motor-starting mechanism is placed in the pedestal, and is controlled by the lever extending through the door at the front. The wheel hoods are adjustable and can be set so that the wheel is always at the front of the hood. The machine can be furnished with or without an exhaust fan. Specifications: Motor: a.c. 2 or 3 phase, 60 cycle, 220 or 440 volt; d.c., 110 or 220 volt; size, continuous service, 5 hp., intermittent, 7$\frac{1}{2}$ hp. Speed; no load, 1,200 r.p.m.; full load, 1,160 r.p.m. Carries two wheels, 18 x 3 in. Arbor length, 54 in. Floor to center of arbor, 34 in. Floor space, 32 x 64 in. Weight, with a.c. motor, 2,200 lb.; with d.c. motor, 2,300 lb.

Clip, paste on 3 x 5-in. cards and file as desired

The greatest changes made in the third edition of the Code are in Part 3. The loading specification, upon which are based the requirements for strength of construction, has been simplified, and has been applied to signal lines crossing railways, for which arbitrary rules were formerly used. The rules have been rearranged in more convenient order, and an index has been added. The sag tables have been extended to cover iron and steel conductors. The new edition of the rules is in pocket size and has been entirely separated from the discussion of the rules which accompanied them in the second edition. This discussion has been considerably amplified and will be published separately as Handbook No. 4, which is now in press. The discussion contitutes a companion volume to the Code itself, and should be secured by those who have occasion to use the rules.

Kinematics and Kinetics of Machinery. By John A. Dent, M.E., and Arthur C. Harper, M.E.; 383 pp. 6 x 9 in. Illustrated with numerous diagrams. Published by John Wiley & Sons, Inc., New York City.

This work is an outgrowth of the notes prepared by Prof. G. A. Goodenough for the students at the University of Illinois. The notes were revised and rewritten by the authors in the present form as a textbook for engineering schools.

The book should have a wide range of usefulness as it is comprehensive enough to suit the needs of the graduate student and at the same time so arranged that material for an elementary course can easily be selected.

Many of the methods are graphical because of the complicated mathematical equations encountered in analyzing any but the simplest machines. A chapter on the mechanics of the gyroscope, written by Prof. F. B. Seely, is included and there are also several valuable "notes" at the end of the book. One of these is a complete investigation of the forces in a gasoline automobile engine of conventional type.

The twelve chapter headings are: I, Machine Motions, Pairs, Links, Chains, Mechanisms; II, Motion of Rigid Bodies; III, Velocities of Mechanisms; IV, Accelerations in Mechanisms; V, Inertia Forces of Machine Parts; VI, Balancing of Engines; VII, Governors; VIII, The Mechanics of the Gyroscope; IX, Critical Speeds and Vibrations; X, Toothed Wheels; XI, Cams; XII, Wrapping Connectors.

Labor Terminology. Issued as Bulletin No. 25 of the Harvard Bureau of Business Research under date of March 1. 108 pp. 5½ x 7¾, unillustrated.

The object of this bulletin is to provide a means of lessening the verbal misunderstandings which often cause or prolong disputes between employers and employees. It contains definitions from the labor standpoint of several hundred terms many of which, such as "open shop," "collective bargaining" and "union shop," are frequently used with different meanings by parties to labor controversies.

This effort to define what labor men mean when they use terms has been made for the purpose of enabling manufacturers and employers to secure a better understanding of the point of view of their men.

Professor Melvin T. Copeland, director of the Bureau of Business Research, states that the bulletin will be used at the Harvard Graduate School of Business Administration in the courses which deal with labor relations, and also will be put on public sale at a price designed to pay in part the cost of compilation.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

A mercantile firm in India desires to purchase and secure an agency for everything electrical, textile machinery, electric passenger and freight elevators, screws and nails, corrugated-iron sheets and galvanized buckets, workshop tools, steel furniture, etc. Quotations should be given c.i.f. Bombay or Calcutta. Terms: Part advance through bank; balance against delivery of documents through bank. Reference, No. 34,632.

A commission merchant in Cuba wishes to represent manufacturers and exporters for the sale on commission of large quantities of iron, steel and general hardware. Reference, No. 34,617.

A firm of engineers in Sumatra desires to secure an agency for the sale of lightweight caterpillar tractors, suitable for use on rubber, tobacco, oil-palm, and rice estates; and also plows and cultivators for use with tractors. Quotations should be given c.i.f. Belawan. Payment: Cash against documents. Reference, No. 34,646.

An American commercial agent, who has sales and office connections in France, is in the United States and desires to be placed in communication with firms with a view to securing an agency for the sale of mechanics' tools, nails, tacks, bolts, screws, locks, padlocks, door checks, door plates, saws of various types, electrical supplies, belting, chains in all metals, and weighing machines. Quotations should be given c.i.f. Havre, France, or f.a.s. N. Y. No. 34,592.

A mining company in Victoria, Australia, desires to purchase machinery for the manufacture of salt and plaster of Paris. Quotations should be given f.o.b. American port. Reference No. 34808.

A mercantile company in Brazil desires to secure an agency for the sale of machinery. Quotations should be given f.o.b. New York. Payment to be in cash. Correspondence should be in Portuguese or French. Reference No. 34713.

A firm of importers in Cuba desires to be placed in communication with manufacturers of locomotive cranes, hoists and machinery of all kinds. Reference No. 34815.

A merchant in Syria desires to purchase hardware, wood and iron working tools and machinery, hand and motor pumps, agricultural machinery, construction material, bar and rod iron, tin plate, cotton and woolen goods, etc. Quotations should be given c. i. f. Beirut, Alexandretta, and Tripoli. Reference No. 34812.

Moens & Beck, Amsterdam, Holland, would like to take over an agency in that country for American firms dealing in iron and steel products and machinery of various kinds.

Trade Catalogs

Electric Hoists. Sprague Electric Works, of General Electric Co., New York, N. Y. Bulletin No. 48967, illustrative and descriptive of several types of electric hoists including bucket, winch, trolley, monorail and crane.

Reilly Evaporator. Griscom-Russell Co., New York, N. Y. Bulletin No. 330, 6 x 9 in., twenty-three pages, describing the latest model of Reilly self-scaling submerged type evaporator. Charts and tables are included.

Vanadium. Vanadium Corporation of America, 120 Broadway, New York City. A forty-nine page 8 x 11-in. catalog covering the use of this "master alloy" in the manufacture of locomotives, automobiles and airplanes.

Electric Cranes. Northern Engineering Works, Detroit, Mich. Bulletin No. 508, illustrating the type "E" standard electric traveling crane.

Lubrication. The Texas Company, New York, N. Y. Volume VII of a monthly magazine taking up problems of lubrication. This number is devoted to turbine lubrication, touching on the effect of high pressure on the viscosity and density of lubricating oils.

Grinding Machines. Norton Company, Worcester, Mass. A thirty-two page 5 x 7-in. catalog describing and illustrating a complete line of grinding machines, grinding wheel stands and fixtures.

Steel and Iron. Thirteenth edition of a comprehensive stock list published in booklet form by Horace T. Potts & Co., Philadelphia, Pa. It shows what the company carries for prompt shipment with weights, price lists and other valuable information.

The Cutler-Hammer System. Cutler-Hammer Manufacturing Co., Milwaukee, Wis. Booklet, pp. 16, 8½ x 11 in. This booklet illustrates and explains the new line of control apparatus, which has recently been developed by this firm for use with high-speed newspaper presses.

Production Lathe. The Porter-Cable Machine Co., Syracuse, N. Y. A well-prepared catalog, sixteen 8½ x 11-in. pages, illustrating and describing the latest model Porter-Cable lathe for intensive manufacturing and rapid production of duplicate parts. Each important feature of the machine is treated separately, with complete illustrations and specifications.

Root Counters. The Root Co., Bristol, Conn. Catalog No. 31, covering a complete line of "Census takers of industry." Many types of counting machines are illustrated and described.

Waugholst. The Denver Rock Drill Manufacturing Co., Denver, Co. Illustrating and describing the many deversified uses of the latest Model-250 Waugholst lifting machine.

Bath Internal Micrometer. John Bath & Co., Inc., Worcester, Mass. Booklet No. 10 describing the Bath internal micrometer and master reference ring, a new tool for the rapid measurement of hobs in production work and for the accurate inspection of gages.

"Commercial" Annular Ball Bearings. The Schatz Manufacturing Co., Poughkeepsie, N. Y. Catalog No. 6, giving a wealth of information regarding the use of the less expensive grades of ball bearings.

Pamphlets Received

Co-operation and Cost Control: National Association of Cost Accountants. The May number of the official publication of this association is devoted to a discussion of an important aspect of cost control—the human side. It brings out the necessity of co-operation between cost and operating departments if the business of obtaining dependable cost figures is to be carried on effectively. The text of the pamphlet is taken from a paper read before the New York Chapter of the Association.

How Business with Foreign Countries is Financed: Guaranty Trust Co., New York, N. Y. A valuable booklet issued by this company outlining the services and facilities offered by its banking machinery in financing foreign trade and explaining the methods and forms generally used. A wealth of valuable information for the exporter and importer is contained in its pages.

Catalogs Wanted

The Engineering School of Drawing, 457 Main St., Springfield, Mass., would be pleased to receive catalogs and other literature on various production machines and tools that are now on the market.

The Hyde Engineering Works, Ltd., Montreal, Canada, would be pleased to receive catalogs from builders of all kinds of machinery, both jobbers and contractors.

Forthcoming Meetings

The Taylor Society will hold its Spring Meeting at the Hotel Statler, Cleveland, Ohio, May 19 to 21.

The spring meeting of the American Society of Mechanical Engineers will be held at the Congress Hotel, Chicago, May 23-26. Calvin W. Rice, Engineering Societies Bldg., 29 West 39th St., New York, is secretary.

The Society of Automotive Engineers, 29 West 39th St., New York announces that its summer meeting will be held at West Baden, Ind., on May 24 to 28 inclusive.

The American Railway Association will hold the Spring meeting of its Purchases and Stores Section at the Blackstone Hotel, Chicago, June 9 to 11, and the Spring meeting of its Mechanical Section at the Drake Hotel, Chicago, June 15 and 16.

The 1921 annual meeting of the American Society for Testing Materials will be held at Asbury Park, N. J., on June 20 to 24, with headquarters at the New Monterey Hotel. C. L. Warwick, Engineers Club, Philadelphia, Pa., is secretary.

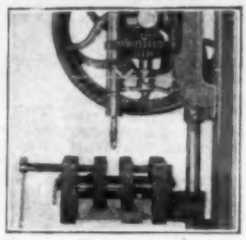
Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Vise, Drilling Machine

Joyce Drill Vise Co., P. O. Box 704, Amarillo, Texas

"American Machinist," March 10, 1921



The vise is made in two sizes, opening 5½ in. and 11 in., respectively. Both jaws are movable, which permits different sizes of work to be held without changing the position of the vise on the drilling machine. The rear jaw is moved by means of a thumbscrew. The front jaw is moved and the work clamped by the screw which is actuated by the vise handle. The jaws are held in alignment by and slide upon two rods. False jaws are furnished with the 11-in. vise, for holding pipe pulleys or round articles up to 9 in. in diameter. It is stated that the vise saves time, drills and labor, and that it is substantially and durably made. It can be attached to any make of drilling machine, the illustration showing one method of attaching it. For fastening it on the table of a drilling machine, a set of special clamps is furnished.

Hammer, Drop, Steam

Massillon Foundry and Machine Co., Massillon, Ohio

"American Machinist," March 10, 1921

The housings are annealed steel castings of I section, machined to fit in deep pockets in the hammer base, which is likewise a steel casting. The cylinder is a semi-steel casting reinforced over the valve. It interlocks in the tops of the housings, so that no tie-plate is required. A safety cylinder is provided to protect the hammer in case the piston rod breaks, it being so made that the piston ascends against a cushion of live steam. The ram guides adjust back into the side frames for the removal of the ram horizontally. The guide-adjusting screws are threaded through nuts set in open pockets in the side frame, thus permitting damaged screws to be removed by cutting out the nut with an acetylene torch without distributing the ram or guides. The ram guides are rectangular in section and of forged steel. The hammers are built in sizes ranging from 800 to 20,000 lb. capacity.

Crane, Industrial, Crawler-Type

Northwest Engineering Works, 28 E. Jackson Blvd., Chicago, Ill.

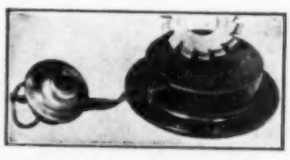
"American Machinist," March 10, 1921

The crane is rated at 10-ton capacity with the load at a radius of 12 ft. It is self-contained, being driven by a four-cylinder, 60-hp. engine. This engine also drives a generating set for the operation of an electric lift magnet, when the latter is required. One advantage claimed for this type of crane is that it can travel anywhere in a storage yard and is not limited in its field to the points that can be reached from tracks. The steering is accomplished by a single control lever. The crawlers are made of manganese steel castings. All bearings are either self-aligning ball bearings or bronze bushings. The crane can also be used to operate a one-cubic-yard clamshell bucket, a pile-driver or a wood grapple. Its capacity at its maximum radius of 30 ft. is 5,200 lb.

Magnet, Electro, Universal

Liberty Engineering Co., Danbury, Conn.

"American Machinist," March 10, 1921

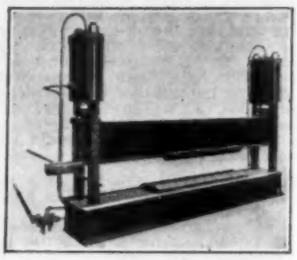


It is stated that the magnet will work equally well on large or small pieces, either a large block of steel or a watch being totally demagnetized by its use. The magnet operates on either a 110 or 220 volt alternating current for demagnetizing; and by the use of a quick-acting safety switch, iron and steel may be magnetized to a strong degree by the same current. Should it be desired to make the work a powerful magnet, a direct-current circuit of 110 volts is employed. As a magnetizer, it may be used in connection with deep-hole drilling, assembling work of various kinds, and to hold screws or articles while inspecting. The magnet is 6 in. in diameter by 1¾ in. high. It weighs 3 lb. The switch and plugs and 5 ft. of cord are furnished.

Press, Plate-Bending

Houston, Stanwood & Gamble Co., Cincinnati, Ohio

"American Machinist," March 10, 1921



The press is especially intended for use in boiler or tank shops, or in any plant doing plate or structural-steel work. The machine consists of a crossbeam, connected to vertical rams at each end by means of hinged bearings, which give flexibility and allow the beam to adjust itself to any unevenness of the work. Either short, long, or sectional dies can be used, flat dies being provided for straightening plates and curved ones for such work as bending boiler plate. The machine does not require an auxiliary ram for returning the crossbeam to its upper position. It is built in various sizes and capacities to suit different classes of work, and it can be furnished to operate either on compressed air or on hydraulic pressure, obtained from city water mains or provided by means of a pump.

Locomotive, Industrial, Gasoline, American

Hadfield-Penfield Steel Co., Bucyrus, Ohio

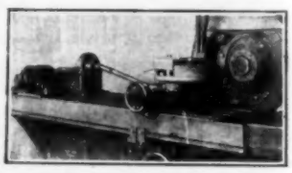
"American Machinist," March 10, 1921

The machine is intended for light haulage purposes where steel rails are provided, as in industrial and construction work. It is built in several gages and sizes from 4 to 7 tons, and can be furnished either in the standard or in the low-built design suitable for mine use. The locomotive is driven by a heavy-duty Hercules, 4-cylinder, 4-cycle, gasoline engine. The engine used for the 4-ton machine has a piston displacement of 226.42 cu.in. and develops 23 hp. at 1,000 r.p.m. The drive from the motor is through friction disks, by means of which the speed can be varied and the direction of travel reversed. The disk shafts are supported on New Departure double-row ball bearings and Hyatt roller bearings, ball thrust bearings being used. The frame of the machine is built up of four cast-iron sections bolted together. The various units are so placed upon the frame as to make a compact arrangement, the operator's position being covered by means of a cab, which can be completely enclosed.

Fixture, Grinding, Rotary

Diamond Machine Co., 9 Codding St., Providence, R. I.

"American Machinist," March 10, 1921

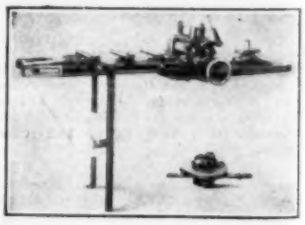


The device is intended for holding circular work while the periphery is being finished. The fixture consists of two units, a plate mounted on a vertical spindle for holding the work, and an electric motor with reduction gearing for revolving it. The illustration shows the fixture used for the grinding of the periphery of a malleable-iron brake shoe, although such things as rollers for conveyors, wheels for small trucks and pulleys can be finished. The crowning of pulleys is accomplished at one setting of the work, it being unnecessary to tilt the work to obtain the necessary slant on the face. By placing the work toward the center of the cupped wheel, so that it makes contact with the inside edge of it, a crown is formed on the periphery, the amount of the curvature depending upon the relative positions of the work and the wheel. Widths of face as high as 10 in. can be handled.

Attachment, Punch Press, Paper-Feeding, Automatic

F. J. Littell Machine Co., 4125 Ravenswood Ave., Chicago, Ill.

"American Machinist," March 10, 1921



The roll of paper stock is mounted on a mandrel supported by brackets on the legs. The strip of paper passes over an adjustable tensioning roller at the extreme left of the attachment and is led through a pair of adjustable angle-iron guides. It then passes under the series of three rollers that are mounted on the top of the extension, and that serve to cause the paper to rest with the necessary pressure on the two blocks of paraffin wax located between the rollers. The arrangement gives to the paper strip a thin coating of paraffin as it passes to the dies, and the paraffin there acts as a lubricant to permit the punching to be drawn into cup-like form without cracking the paper. The automatic feeding rolls can be adjusted for feeding the proper lengths of stock for each stroke of the die.

Clip, paste on 3 x 5-in. cards and file as desired

NEW *and* ENLARGED

Machine Tools Wanted

If in need of machine tools send us a list for publication in this column

Mass., Boston—The G. W. Bent Co., 101 Causeway St., Manufacturer of brass and steel bedsteads—power angle iron or bar shears with capacity to cut 3 in. x 3 in. x ⅜ in. steel angles.

Mass., Springfield — The Hannan Finton Co., 39 Sharon St.—No. 2 Colburn drill press for its machine shop.

R. I., Providence—Kelman & Lagovitz, 32 Ash St.—repair equipment for garage.

Md., Baltimore—The Amer. Coal Loading Machine Corp., P. O. Box No. 1479, M. R. Martin, Purch. Agt.—complete shop equipment to include castings, etc.

N. J., Elizabeth—The Amer. Stamping Co., 238 3d St., Manufacturer of metal toys—back gear double acting power press, preferrably with a 5 in. stroke.

N. J., Newark — The Cook Electric Co., 360-364 Jelliff Ave.—metal working tools.

N. Y., Hastings-on-the-Hudson — The Hastings Pavement Co.—spindle with No. 4 Morse taper for 3½ ft. Fosdick heavy radial drill.

Special spindle with No. 5 Morse taper for 3½ ft. Fosdick heavy radial drill.

N. Y., New York—(Borough of Manhattan) The Argonne Motor Co., 120 West 31st St.—

11 in. x 5 ft. style "E" lathe with compound rest, etc.

No. 1 C Fox hand miller with plain vise, arbor and countershaft.

No. 1 Cincinnati universal miller with vise, arbor, dividing head, countershaft and 6 in. x 6 in. angle plate.

10 in. Buffalo bench drill.

N. Y., New York—(Borough of Manhattan, The Monsoon Cooling System, 70 West 45th St.—

Small gap lathe, compound rest, countershaft and complete standard equipment.

No. 52 Beloit combined power punch and shear.

Pa., Philadelphia — The C. and A. Mfg. Co., 1851 Germantown Ave., manufacturers of sheet metal specialties, G. F. Cills, Purch. Agt.—one 37 in. sq. shears, ¼ ft. cornice brake, one 37 in. slip rolls and one adjusting folder and turning machine.

Pa., Scranton—The Delaware, Lackawanna & Western R.R., Coal Mining Dept.—lathes, drill presses, planer and boring machine for its forge and machine shop at Forty Fort, Pa.

Ala., Birmingham—The Iron City Pipe & Fdry. Co., 2129 3d Ave.—18 in. jointer, No. 5 trimmer, wood turning lathe with 12 in. swing between centers.

Va., Alexander—The Herfurth Engine & Machinery Co., Duke St., R. W. Herfurth, Purch Agt.—16 in. x 16 in. or 18 in. x 8 in. screw cutting lathe. (Used.)

W. Va., Logan—The Logan Machine & Electric Co., Inc., D. B. Browning, Secy.—machine shop eqiupment, insulating materials and magnet wire.

Ill., Aurora—The Divekey Bros. Mfg. Co. (Plumbers)—1 pipe machine to cut and thread from ⅜ to 4 in. diameter pipe, motor drive (new).

Ill., Aurora—The Durabilt Steel Locker Co., 65 South Bway.—10 ft. power squaring shear, 16 gage or ⅛ in. capacity.

30 in. ft. squaring shear, 18 gage capacity.

Open back inclinable press; No. 2 consolidated or equivalent.

Back geared, open back, inclinable press; No. 30 or No. 100 consolidated or No. 107 or No. 108 Niagara, or similar.

8 ft. O. H. L. power brake with ⅛ in. capacity, or equivalent.

Double head light tool grinder with one adjustable table.

Single spindle 14 in. sensitive floor drill press.

10 kw. electric spot welder with approximately 18 in. horn.

18 in. swing cut-off saw. (All used.)

Ill., La Salle—The Appolo Metal Wks.—Weisbecker grinding and polishing machine for polishing copper, steel, etc.

Mich., Detroit—The Quick Change Auto Rim Co., 439 East Fort St.—miscellaneous equipment for making rims for automobile wheels.

O., Columbus—The Jaeger Machine Co., 520 Dublin Ave.—one small power punch, maximum capacity ⅛ in. hole in ⅜ in. plate. (Used.)

O., Galion—The Galion Iron Wks. & Mfg. Co.—one Williams White Bulldozer, No. 6 or No. 7. (New.)

O., Madison—The Lyon King Implement Co., W. E. Arnold, Pres.—drill presses, punch presses, lathes, bending rolls, grinding stands, etc.

Wis., Fond du Lac—J. F. Ahern Co., 70 South Portland St., manufacturer of heating supplies, etc., J. Ahern, Purch. Agt.—pipe cutting machine.

Wis., Kaukauna—The Molock Co., manufacturers of stokers—one Adams gear hopper or automatic gear cutter, capacity from 2 in. to 6 in diameter, 10 pitch. (Used.)

Wis., Milwaukee—The Babcock Automobile Spring Co., 641 Jefferson St., C. Babcock, Purch. Agt. ½ to ⅜ in. stencil cutting machine.

Wis., Necedah—The Necedah Mfg. Co., manufacturer of row boat motors, Ford timers, etc.—screw machines and lathes.

Wis., Oshkosh—The Oshkosh Tractor Co., 172 Mt. Vernon St., J. Casey, Purch. Agt.—lathes, drill presses, shapes and other machinery for the manufacture of motors.

Wis., Slinger—The Wickert Sheet Metal Wks.—necessary machinery for repairing auto radiators.

Wis., Oshkosh—The Oshkosh Tractor Co.—equipment.

Ia., Grinnell—The Bd. Educ., F. P. Marvin, Pres.—manual training equipment for school.

Ia., Ottumwa—The Bd. Educ., J. A. Wagner, Clk.—manual training equipment for school.

Kan., Hutchinson—The Superior Welding Shop, 114 South Washington St.—one 24 to 30 in. lathe and one universal milling machine.

Mo., Kirkwood—The Bd. Educ., W. F. Knowlton, Pres.—manual training equipment for school.

Wash., Seattle—The School Bd., Central Bldg.—equipment for shop in high school.

Ont., Kingsville — A. Conklin & Son — modern garage equipment.

Tex., Dallas—The Texas Boiler Wks., 2321 Live Oak St., H. H. Sharp, Vice Pres. and Gen. Mgr.—bending rolls, sizes 8 to 12 ft. to handle ⅜ in. plate. (Used.)

Machinery Wanted

Ga., Atlanta—The Capital City Laundry—laundry, dyeing and rug cleaning machinery.

Ala., Ethelville—The J. H. Holmes Lumber Co., R. F. D. No. 2, J. H. Holmes, Purch. Agt.—Edgers and trimmers and other woodworking machinery.

Fla., Bartow—The Florida Mill & Planing Mill, T. Junear, Purch. Agt.—machinery for saw mill, etc.

Fla., St. Petersburg—The H. and A. Wood Products Co., Furniture and Toy Manufacturers, H. J. Albright, Secy. and Treas.—quick action woodworkers' vises and iron clamps used in connection with wooden bar for woodworkers in glueing table tops, etc.

N. C., Rutherfordton—J. L. Taylor—complete bottling plant machinery, etc.

W. Va., Welch—The Ward Pocahontas Coal Co., T. A. Lambert, Pres. — aérial tramway.

O., Cleveland—The Interstate Products Co., 1781 Winter St.—paint mills. (All sizes.)

Wis., Chippewa Falls—The Chippewa Valley Produce Co., Putnam St., manufacturer of dairy products—refrigerating machinery.

Wis., Hawkins—The Northern Sash & Door Co., O. L. Holtz, Purch Agt.—woodworking machinery.

Wis., Kewaunee—The Slovan Co-operative Cheese Co., Route 7, F. Sisel, Secy.—cheese making machinery.

Wis., Milwaukee—The E. & W. Mfg. Co., 325 Oregon St.—woodworking machine.

Wis., Milwaukee—The Nu-Wood Corp., 22d and Forest Home Aves., manufacturer of exterior stucco plaster for houses, H. Dorn, Purch. Agt.—special straw-weaving machinery.

Okla., Okmulgee—The Burdsall Paint & Glass Co., 203 North Morton St., J. Birdsall, Purch. Agt.—roughing and emery wheel with sand box, roughing plate and sand hopper for bevelling plate glass, and upright smoother, complete.

Ont., Toronto — The Provincial Government, Dept. of Pub. Hwy.—machinery for cement plant.

Metal Working

NEW ENGLAND STATES

Conn., Hartford — R. L. Fox, Asiyum Ave., plans to build a 1 story garage and service station on Asiyum Ave. and Hopkins St. Estimated cost, $80,000.

Conn., Hartford — Fuller Brushes Inc., Spruce St., has awarded the contract for the construction of a 2 story addition to brush factory. Estimated cost, $20,000.

Conn., New Haven—The Ratner Constr. Co., 425 George St., will build a 1 story, 70 x 140 ft. garage on Grand Ave. Estimated cost between $35,000 and $40,000.

THE WEEKLY PRICE GUIDE

This Week's Market

The metal market is slightly firmer than a week ago. Copper and zinc are up ¼c. Practically no changes in iron and steel. Old metals still dead. Stagnation true for Cleveland and Chicago, as well as for New York.

IRON AND STEEL

PIG IRON—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$28.75
Northern Basic	26.52
Southern Ohio No. 2	27.52
NEW YORK—Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	34.26
BIRMINGHAM	
No. 2 Foundry	24.00
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25–2.75	26.26
Virginia No. 2	*27.00
Basic	†25.00
Grey Forge	*25.00
CHICAGO	
No. 2 Foundry local	24.00
No. 2 Foundry, Southern, sil 2.25@2.75	30.66
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	26.46
Basic	24.46
Bessemer	26.96

* F. o. b. furnace. † Delivered.

STEEL SHAPES—The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses at the cities named:

	New York Warehouse Jersey City	New York Delivered	Cleveland	Chicago Delivered
Structural shapes	$3.23	$3.33	$3.09	$3.23
Soft steel bars	3.13	3.23	2.99	3.13
Soft steel bar shapes	3.13	3.23	3.48	3.13
Soft steel bands	4.18	4.28	6.25	
Tank plates	3.23	3.33	3.78	3.23

BAR IRON—Prices per 100 lb. at the places named are as follows:

Mill, Pittsburgh	$2.20
Warehouse, New York, delivered	3.13
Warehouse, Cleveland	3.52
Warehouse, Chicago	3.13

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York,	Cleveland	Chicago
No. 10	3.10	4.25	4.00	4.13
No. 12	3.15	4.30	4.05	4.18
No. 14	3.20	4.35	4.10	4.23
No. 16	3.30	4.45	4.20	4.33
Black				
Nos. 17 and 21	3.75	4.95	4.80	5.20
Nos. 22 and 24	3.85	5.00	4.85	5.25
No. 25 and 26	3.90	5.05	4.90	5.30
No. 28	4.00	5.15	5.00	5.40
Galvanized				
No. 10 and 11	4.00	5.30	5.00	5.70
No. 12 to 14	4.10	5.40	5.10	5.80
Nos. 17 and 21	4.40	5.70	5.40	6.10
Nos. 22 and 24	4.55	5.85	5.55	6.25
No. 26	4.70	6.00	5.70	6.30
No. 28	5.00	6.25	6.00	6.40

COLD FINISHED STEEL—Warehouse base prices are as follows:

	New York	Chicago	Cleveland
Round shafting or screw stock, per 100 lb	$4.73	$4.63	$4.25
Flats, squares and hexagons, per 100 lb	5.23	4.63	4.75

DRILL ROD—Discounts from list price are as follows at the places named:

	Per Cent
New York	65%
Cleveland	50%
Chicago	50%

Electric Welding Wire—Welding wire in 100-lb. lots sells as follows, f.o.b. New York: 5/32, 8½c. per lb.; ¼, 8c.; 5/16 to ½, 7½c. Domestic iron sells at 12c. per lb.

MISCELLANEOUS STEEL—The following quotations in cents per pound are from warehouse at the places named:

	New York	Cleveland	Chicago
Openhearth spring steel (heavy)	5.50	8.00	8.25
Spring steel (light)	8.00	7.00	10.50
Coppered Bessemer rods (base)	8.00	8.00	6.20
Hoop steel	3.64	3.69	3.83
Cold rolled strip steel	8.00	8.25	7.90
Floor plates	5.30	3.09@3.40	5.78

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the Pittsburgh basing card of April 13, 1921:

BUTT WELD

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
1 to 3	62½	50	⅛	33½	18½
			¼ to 1¼	35½	20½

LAP WELD

2	54½	41	2	30½	16½
2½ to 6	58½	45	2½ to 4	34½	22½
7 to 12	54½	44	4½ to 6	33½	21½
13 and 14	45	37	7 to 8	24½	12½
15	42½	32	9 to 12	19½	7½

BUTT WELD, EXTRA STRONG, PLAIN ENDS

1 to 1½	60½	49	1 to 1½	35½	21½
2 to 3	61½	50			

LAP WELD, EXTRA STRONG, PLAIN ENDS

2	52½	41	2	31½	18½
2½ to 4	56½	45	2½ to 4	34½	22½
4½ to 6	55½	44	4½ to 6	33½	21½
7 to 8	50½	37	7 to 8	24½	12½
9 to 12	45½	32	9 to 12	19½	7½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

METALS

MISCELLANEOUS METALS—Present and past New York jobbers' quotations in cents per pound, in quantities up to car lots:

Copper, electrolytic	13.87½
Tin in 5-ton lots	33.62½
Lead	5.62½
Zinc	5.87½
ST. LOUIS	
Lead	5.22½
Zinc	5.47½

At the places named, the following prices in cents per pound prevail, for 1 ton or more:

	New York	Cleveland	Chicago
Copper sheets, base	20.50	22.00	23.50
Copper wire (carload lots)	15.00	17.50	20.00
Brass sheets	17.25	24.00	24.50
Brass pipe	21.00	22.00	20.75
Solder (half and half) (case lots)	24.00	22.75	17.50

Copper sheets quoted, above hot rolled 24 oz., cold rolled 14 oz. and heavier, add 2c.; polished takes 5c. per sq.ft. extra for 20-in. widths and under; over 20 in., 7½c.

BRASS RODS—The following quotations are in cents per pound at warehouse:

New York	15.25
Cleveland	19.00
Chicago	18.75

NICKEL AND MONEL METAL—Base prices in cents per pound, any quantities, f.o.b. Bayonne, N. J.

Nickel	
Ingots and hot	41
Electrolytic	43

Monel Metal			
Shot and blocks	35	Hot rolled rods (base)	42
Ingots	38	Cold rolled rods (base)	56
Sheet bars	40	Hot rolled sheets (base)	55

Special Nickel and Alloys	
Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	60
Cold drawn rods, Grade "A" and "C" (base)	72
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods, "D"—low manganese	64
Manganese nickel hot rolled (base) rods "D"—high manganese	67

SHOP MATERIALS & SUPPLIES

ZINC SHEETS—The following prices in cents per pound are f. o. b. mill less 8% for carload lots..... 11.00

	Warehouse	
	In Casks	Broken Lots
New York	12.00	12.50
Cleveland	12.15	12.50
Chicago	15.75	16.25

ANTIMONY—Chinese and Japanese brands in cents per pound, in ton lots for spot delivery, duty paid:

New York	6.00
Chicago	6.00
Cleveland	7.50

OLD METALS—The following are the dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	10.00	10.00	$9.50
Copper, heavy, and wire	9.00	9.50	8.50
Copper, light, and bottoms	8.00	8.00	7.50
Lead, heavy	3.25	4.00	3.25
Lead, tea	2.00	3.00	3.00
Brass, heavy	6.00	6.00	9.00
Brass, light	4.50	5.00	4.50
No. 1 yellow brass turnings	5.00	5.00	5.00
Zinc	3.00	3.00	3.00

ALUMINUM—The following prices are spot from warehouse, cents per pound:

	New York	Cleveland	Chicago
No. 1 aluminum, 98 to 99% pure, in ingots for remelting (1-15 ton lots), per lb	28.4	25.50@26.00	30.00

COPPER BARS—From warehouse sell as follows in cents per pound, for ton lots and over:

	Current
New York (round)	22.00
Chicago	20.50
Cleveland	22.50

BABBITT METAL—Warehouse price in cents per pound:

	New York	Cleveland	Chicago
Best grade	70.00	43.50	35.00
Commercial	30.00	15.50	9.00

NOTE—Price of babbitt metal is governed largely by formula, no two manufacturers quoting the same prices. For example, in New York, we quote the best two grades, although lower grades may be obtained at much lower prices.

SHOP SUPPLIES

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	New York	Cleveland	Chicago
Hot pressed square	List	$2.00	1.60
Hot pressed hexagon	List	2.00	1.60
Cold punches hexagon	List	2.00	1.60
Cold punched square	List	2.00	1.60

Semi-finished nuts, ⅜ and smaller, sell at the following discounts from list price:

	Current
New York	60%
Chicago	50%
Cleveland	75–10%

MACHINE BOLTS—Warehouse, discounts in the following cities:

	New York	Cleveland	Chicago
All sizes up to 1 by 30 in	50–10%	60–10%	50%
1¼ and 1½ in. by 3 in. up to 12 in	50%	50–5%	45%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:
New York..... $2.00 Cleveland..... $4.00 Chicago..... $4.00
For cast-iron washers, ¼ and larger, the base price per 100 lb. is as follows:
New York..... $4.50 Cleveland..... $3.75 Chicago..... $4.00

CARRIAGE BOLTS—From warehouses at the places named the following discounts from list are in effect:

	New York	Cleveland	Chicago
¼ by 6 in. and smaller	40%	50–10%	40%
Larger and longer up to 1 in. by 30 in.	40%	50%	40%

COPPER RIVETS AND BURS sell at the following rate from warehouse:

	Rivets	Burs
Cleveland	40%	10%
Chicago	net	net
New York	40%	25%

RIVETS—The following discounts are allowed for fair-sized orders from warehouse:

	New York	Cleveland	Chicago
Steel ½ and smaller	50%	60%	45%
Tinned	45%	60%	30%

Structural, ¼, ½, 1 in. diameter by 2 to 5 in. sell as follows per 100 lb.:
New York...$4.65 Cleveland...$4.60 Chicago....$4.88 Pittsburgh..$3.70
Boiler, same sizes:
New York...$4.75 Cleveland...$4.70 Chicago....$4.98 Pittsburgh..$3.80

MISCELLANEOUS

SEAMLESS DRAWN TUBING—The base price in cents per pound from warehouse in 100-lb. lots is as follows:

	New York	Cleveland	Chicago
Copper	22.25	25.00	25.50
Brass	21.00	24.00	24.50

Prices vary with the quantity purchased. For lots of less than 100 lb., but not less than 75 lb., the advance is 1c.; for lots of less than 75 lb., but not less than 50 lb., 2½c. over base (100-lb. lots); less than 50 lb., but not less than 25 lb., 5c. should be added to base price; quantities less than 25 lb. add 10c. per lb.

Double above extras will be charged for angles, channels and sheet metal mouldings if ordered in above quantities. Above extras also apply to brass rod other than standard stock sizes—stock sizes being considered as ⅛-2 in., inclusive in rounds, and ⅛-1½ in., inclusive in square and hexagon—all varying by thirty seconds up to 1 in. by sixteenths over 1 in. On shipments aggregating less than 100 lb., there is usually a boxing charge of $0.75.

LONG TERNE PLATE—In Chicago No. 28 primes from stock sell, nominally, for $7.70 per 100 lb. In Cleveland—$7.00 per 100 lb.; New York price is $7.50.

COTTON WASTE—The following prices are in cents per pound:

	New York Current	Cleveland	Chicago
White	9.00@12.00	12.50	14.25
Colored mixed	6.50@ 9.50	9.50	12.00

WIPING CLOTHS—Jobbers' price per 1,000 is as follows:

	13½x13½	13½x20½
Cleveland	$55.00	$65.00
Chicago	41.00	43.50

SAL SODA sells as follows per 100 lb.:

	Current
New York (5 bbl.)	$2.10
Philadelphia (5 bbl)	1.85
Cleveland	3.25
Chicago	2.50

ROLL SULPHUR in 360-lb. bbl. sells as follows per 100 lb.:

	Current
New York (5 bbl.)	$2.55
Philadelphia (5 bbl.)	2.55
Chicago	4.50

COKE—The following are prices per net ton at ovens, Connellsville

	Current
Prompt furnace	$3.50@$4.25
Prompt foundry	4.50@ 5.50

FIRE CLAY—The following prices prevail:

		Current
Ottawa, bulk in carloads	100-lb. bag	$0.80
Cleveland	100-lb. bag	0.80

LINSEED OIL—These prices are per gallon:

	Current		
	New York	Cleveland	Chicago
Raw in barrels (5 bbl. lots)	$0.73	$0.75	$0.82
5-gal. cans	.76*	.85	1.07

*Charge of $2.25 for two cans.

WHITE AND RED LEAD—Base price per pound:

	Current		
	Red		White
	Dry	In Oil	Dry and In Oil
100 lb. keg	13.00	14.50	13.00
25 and 50-lb. kegs	13.25	14.75	13.00
12½-lb. keg	13.50	15.00	13.50
5-lb. cans	16.00	17.50	16.00
1-lb. cans	18.00	19.50	18.00

500-lb. lots less 10% discount; 2,000-lb. lots less 10-4% discount; 10,000 lb. lots less 10-7½% discount.

Conn., Norwalk—J. Donaldson, 32 Washington St., has awarded the contract for the construction of a 1 story, 50 x 136 ft. service station on West Ave. Estimated cost, $25,000. Noted April 28.

Conn., Norwalk—S. Kantor, 65 Cross St., plans to build a 1 story, 80 x 160 ft. garage and service station on Isaac St. Estimated cost, $40,000. H. W. Mather, 70 Washington St., Archt.

Conn., Waterbury — I. N. Albert, 268 South Main St., is having plans prepared for the construction of a 1 story, 50 x 185 ft. garage on North Main St. Estimated cost, $50,000. F. A. Wenzel, 6 Glen Ridge St., Archt.

Me., Bangor—The Swett Mullin Co. has awarded the contract for the construction of a 3 story, 100 x 130 ft. garage, sales and service building on Franklin St. Estimated cost, $250,000.

Me., Waterville—The Lewiston Buick Co., Lewiston, will build a 1 story, 90 x 114 ft. sales and service station. Estimated cost, $35,000.

Mass., New Bedford—Leary & Walker, Archts. and Engrs., Times Bldg., will soon award the contract for the construction of a 2 story, 62 x 124 ft. shop and garage on Kempton St., for G. J. Allen & Co., (Plumbers) 91 North Water St. Estimated cost, $75,000.

Mass., Springfield—Cordner & Montague, 373 Bay St., plans to build a 3 story, 160 x 210 ft. garage and warehouse near Railroad St. Estimated cost, $350,000. F. L. Knowlton, Engr.

R. I., Pawtucket—J. D. Crosby Co., Farrell St., has awarded the contract for the construction of a 1 story, 50 x 50 ft. addition to its iron foundry. Estimated cost, $10,000.

R. I., Providence — The Donnelly Taxi Motor Service Inc., 16 Dorrance St., is having plans prepared for the construction of a 1 story, 83 x 116 ft. garage and service station on Chestnut St. Estimated cost, $25,000. W. R. Walker & Son, 17 Custom House St., Archt.

R. I., Providence—Kelman & Lagovitz, 32 Ash St., plans to build a 1 story garage and repair station on Willard Ave. and Hilton St. Estimated cost, $10,000. Private plans.

R. I., Providence—S. Large, 208 Willard Ave., will soon award the ontract for the construction of a 1 story, garage and service station on Hilton and Ash Sts. Estimated cost, $35,000. W. G. Richards, 17 Exchange St., Archt.

R. I., Providence—L. Shea, Willard Ave., is having plans prepared for the construction of a 1 story, 64 x 121 ft. garage on Ash St. Estimated cost, $25,000. W. G. Richards, 17 Exchange St., Archt.

R. I., Providence — Z. Zawatsky, Pawtucket Ave., has awarded the contract for the construction of a 1 story, 100 x 120 ft. garage.

MIDDLE ATLANTIC STATES

D. C., Washington — The Metropolitan Garage Co. will soon award the contract for the construction of a 6 story warehouse on L. St. between 13th and 14th Sts. N.W. Estimated cost, $300,000. H. M. Bralove, Pres. Milburn Heister & Co., Union Savings Bank Bldg., Archts.

N. Y., New York—(Boro of Manhattan) The L. & B. Constr. Co., Inc., 700 Trinity Ave., is having plans prepared for the construction of a 1 story, 100 x 270 ft. garage at 402 East 107th St. Estimated cost, $80,000. J. DeHart, 1039 Fox St., Archt. and Engr.

N. Y., New York—(Borough of Manhattan) R. McCracker, 373 West 125th St., is having plans prepared for the construction of a 1 story, 100 x 188 ft. garage at 429 East 124th St. About $40,000. S. J. Lang, 110 West 34th St., Archt. and Engr.

N. J., Newark—The Cook Electric Co., 360-364 Jelliff Ave., plans to build a 40 x 75 ft. factory for the manufacture of motors. Estimated cost, $20,000. S. S. Cook, Engr.

N. J., Newark—L. Koppelon, 208 Hillside ave., will soon award the contract for the construction of a 98 x 118 ft. garage and store building on Chapel Court. Estimated cost, $60,000. H. Rosensohn, 188 Market St., Engr.

N. J., Newark—I. Raskind, 216 Hillside Ave. will receive bids until June 1 for the construction of a 2 story, 40 x 80 ft. store, garage and apartment building on Broad and Wright Sts. Estimated cost, $40,000. A. Peters, 828 Broad St., Archt. and Engr.

Pa., Philadelphia—M. Gallagher, 63d and Woodbine Sts., is having plans prepared for the construction of a 1 story, 60 x 30 ft. store and service station on 62d and Woodbine Sts. R. A. Kerns, Fuller Bldg., Archt.

MIDDLE WEST STATES

Ill., Chicago—J. J. Kocher, Archt., 6250 South Halsted St., will soon award the contract for the construction of a 1 story, 75 x 160 ft. garage, for T. J. Kiernan, 5859 Prairie Ave. Estimated cost, $40,000.

Ill., Chicago—The Wagner Bros., 5630 Harper Ave., have had plans prepared for the construction of a 1 story, 100 x 100 ft. garage. Estimated cost, $35,000. W. P. Doerr, 28 Jackson St., Archt.

Mich., Detroit—Saxer & Stein, c/o J. I. Weinberg, Archt., 401 Congress Bldg., will soon award the contract for the construction of a 2 story, 50 x 120 ft. garage and service station on Cass Ave. and Prentis St. Estimated cost, $40,000.

Wis., Cashton—M. Brody & Son, will receive bids about June 1 for the construction of a 2 story, 50 x 100 ft. garage and repair shop. Estimated cost, $60,000. Parkinson & Dockendorff, Linker Bldg., La Crosse, Archts.

Wis., Milwaukee—The West Side Express Co., 2319 Lisbon Ave., is having plans prepared for the construction of a 3 story, 30 x 130 ft. warehouse and a 1 story, 100 x 100 ft. garage. Estimated cost, $150,000. Buemming & Guth, 521 Jackson St., Archts.

Wis., Oshkosh—The Oshkosh Tractor Co. plans to build a 5 story, 60 x 210 ft. tractor factory on Main St. Estimated cost, $200,000.

STATES WEST OF THE MISSISSIPPI

Minn., Minneapolis—The Johnson Automotive Service Co. plans to build a 3 story, 80 x 118 ft. factory on Lyndale Ave. South between 27th and 28th Sts. Estimated cost, $90,000. A. A. Johnson, Pres.

Minn., Minneapolis—D. C. Thwing, 945 Andrus Bldg., wil receive bids about May 25 for the construction of a 2 story, 70 x 152 ft. garage at 1315 La Salle Ave. Estimated cost, $65,000. Bertrand & Chamberlin, 616 Northwestern Bank Bldg., Archts.

CANADA

Ont., Kingsville—A. Conklin & Son will soon award the contract for the construction of a 60 x 150 ft. garage with wing addition on Main St. Estimated cost, $50,000.

FOREIGN

T. H., Pearl Harbor—The Bureau of Yards & Docks, Navy Dept., Wash., D. C., will receive bids until June 29 for the construction of foundations to machine shop here.

General Manufacturing

NEW ENGLAND STATES

Conn., Norwalk—C. H. Harris, Inc., 136 West 24th St., New York City plans to build a 1 story factory to cover 30,000 sq. ft. of floor space on Main St., here, for the manufacture of windshields and other glass products. Estimated cost, $100,000.

Me., Winthrop—C. M. Bailey Sons Oilcloth Co. is having plans prepared for the construction of a factory to include a 3 story, 50 x 145 ft., 3 story, 95 x 120 ft. and a 1 story 80 x 98 ft. buildings. Estimated cost, $250,000. The Austin Co., 217 Bway., New York City, Engr.

Mass., Lawrence—The Oppenheim Clothing Co., 495 Essex St., will soon award the contract for the construction of a 2 story, 50 x 160 ft. clothing factory on Essex St. Estimated cost, $70,000. Tuck & Gilman, 34 School St., Boston, Archts. and Engrs.

MIDDLE ATLANTIC STATES

Pa., Philadelphia — A. Wolstenholme & Sons, 24th and Alleghany Sts., has awarded the contract for the construction of a 2 story, 35 x 65 ft. factory for the manufacture of wool and a garage on Fox and Alleghany Sts.

MIDDLE WEST STATES

Ill. Chicago—The Great Western Laundry Co., 2139 West Madison St., has awarded the contract for the construction of a 3 story, 95 x 175 ft. laundry at 3125 West Madison St. Estimated cost, $175,000. Noted Dec. 2.

Ind., Elkhart—The Amer. Coating Mills will soon award the contract for the construction of a 3 story, 100 x 160 ft. paper mill on Division St. Estimated cost, 675,000. J. L. Carey, 208 North Laramie Ave., Engr.

Ind., Ft. Branch—The Swinney Printing Co. will soon receive bids for the construction of a 1 story, 40 x 120 ft. printing plant. Estimated cost, $40,000. Anderson & Stingle, Evansville, Archts. Noted May 5.

Ind., Gary—The Barnes Ice and Coal Co., 105 Bway., will build a 2 story, 72 x 100 ft. ice plant. Estimated cost, $75,000.

Ind. Indianapolis — The Model Laundry Co., 614-18 East Ohio St., has awarded the contract for the construction of a 3 story, 42 x 75 ft. laundry on East Ohio St. Estimated cost, $50,000.

Mich., Detroit—Friesema Bros., Shelby and Larned Sts., have awarded the contract for the construction of a 2 story, 100 x 186 ft. printing building on East Grand Blvd. and Moran St. Estimated cost, $110,000.

O., Columbus—The Federal Ice & Refrigerating Co 20th and Whitcomb Sts., has awarded the contract for the construction of a 1 and 2 story ice plant on 20th St. Estimated cost, $90,000.

Wis., Milwaukee—A. D. Koch, Archt., 120 Wisconsin St., will receive bids until May 21 for the construction of a 2 story, 60 x 165 ft. addition to wholesale bakery on Central Ave., for the Atlas Bread Co., 927 Central Ave. Estimated cost, $125,000.

Wis., Milwaukee — Lesser & Schutte, Archts., Camp Bldg., will receive bids until May 23 for the construction of a 3 story, 45 x 90 ft. addition to packing plant for R. Gumz & Co., 125 Muskego Ave. Estimated cost, $50,000. Noted April 28.

Wis., Racine—The New York Market Co., 132 Washington St., has awarded the contract for the construction of a 2 story 100 x 110 ft. sausage factory, on Standard Ave. Noted March 17.

STATES WEST OF THE MISSISSIPPI

Col., Denver—The Farmers Union Milling & Elevator Co., 1725 Wazee St., has awarded the contract for the construction of a 6 story, 38 x 76 ft. mill and elevator building on 38th and Wyncoop Sts. Estimated cost, $200,000.

Ia., Cedar Rapids—The Peterson Baking Co., 316 6th Ave. E., will soon award the contract for the construction of a 2 story, 60 x 140 ft. factory on 6th Ave. and 4th St. Estimated cost, $80,000. Natton, Holmes & Anthony, 323 Masonic Temple, Archts.

Ia., Mt. Pleasant—The State Bd. of Control will soon award the contract for the construction of a 2 story, 60 x 120 ft. laundry. Estimated cost, $85,000. W. D. Sheehan, Des Moines, Secy. H. F. Liebbe, State Capitol Bldg., Des Moines, Archt.

Minn., Minneapolis—The Northern Display Advertising Co., 2016 Washington Ave., is having plans prepared for the construction of a 2 story, 110 x 225 ft. printing plant on 21st St. and Washington Ave. Estimated cost, $100,000. Zimmerman, Saxe & Zimmerman, 64 East Van Buren St., Chicago, Ill., Archts.

Mo., St. Louis — The Fleischman Yeast Co., 1535 Market St., will soon award the contract for the construction of a 3 story, 75 x 170 ft. factory at Forest Park and Bogle Ave. Estimated cost, $50,000. H. K. Stephens, Mgr. C. A. Jackson, 701 Washington St., New York City, Archt. Noted Dec. 23.

CANADA

Ont., Durham—The Jackson Mfg. Co. has taken over the buildings of the Chemical Co. and will remodel and build a 2 story, 60 x 75 ft. addition and install equipment for the manufacture of gramaphones. Estimated cost, $60,000.

Ont., Goderich—The Natl. Shipbuilding Co. plans to rebuild its plant on Maitland St., which was recently destroyed by fire. Estimated cost, $125,000. W. Hutchinson, Mgr.

Ont., St. Catharines—The Nukol Fuel Co., Ltd., 88 Bay St., Toronto, plans to build an artificial fuel plant, here. Estimated cost, $500,000.

Que., Montreal — The Canadian Consolidated Rubber Co., Inspector St., will soon receive bids for the construction of a 4 story factory on Alexander St. Estimated cost, $50,000.

Sask., Weyburn—The Saskatchewan Co-operative Creameries, Regina, plans to construct a creamery and cold storage plant here. Estimated cost, $60,000.

Sask, Yorkton—The Saskatchewan Co-operative Creameries Ltd., Regina, plans to construct a creamery and cold storage plant here. Estimated cost, $75,000.